ENGINEERING NEWS

41709

AND

AMERICAN RAILWAY JOURNAL

VOLUME XXVIII.

JULY–DECEMBER, 1892.

ENGINEERING NEWS PUBLISHING CO.,

NEW YORK.

INDEX

TO VOLUME XXVIII., JULY-DECEMBER, 1892.

Subdivided into ILLUSTRATIONS; GENERAL (including *Editorials, Technical Articles, Current News, Correspondence*, and anything of technical interest occurring in notices of *New Publications, Society Proceedings and Construction News*); PERSONALS; NEW PUBLICATIONS; SOCIETY PROCEEDINGS; and PRICES.

INDEX TO ILLUSTRATIONS.

A

Accidents: Bridge: Cannich, Scotland. ... 330
Orb, France ... 291
Rainsville, Ind ... 255
San Miguel ... 192
Railway, British, Diagrams of Deaths and Injuries, 1874-91 ... 213
Air Lock, Victoria Bridge ... 223
Air Pump, Westinghouse ... 612
Arches: Concrete, 59-ft. Span ... 451
Gour Noir Viaduct, France ... 149, 166*
Movements of ... 150
Wrought Iron, Stockton-on-Tees, England ... 222
Armor Plate Pierced by Justin Projectile ... 105

B

Ball Bearing Nut, Sprague-Pratt Elevator ... 483
Bessemer Converter, Surface Blowing ... 242
Blast Furnace, Rock Drill for ... 427
Block System, Kinsman, Throttle Closing and Brake Applying Apparatus ... 297
Board Tree Hill, B. & O. R. R ... 30
Boilers: Explosion of, Worcester, Mass ... 557
Portable, Contractors and Quarrymen ... 547
Boiler Feeder, Van Auken Automatic ... 63
Boiler Plant, Curtis, Davis & Co ... 512
Boiler Setting, Wellman Iron & Steel Co., Thurlow, Pa ... 342
Boiler Tubes: New Mannesmann ... 117
Scraper for ... 237
Test of ... 90
Brace, Dunn Extensible, for Sewer Trenches ... 5
Brake Applying Apparatus, Kinsman ... 297
Brakes: Machine for Testing Effect on Wheels ... 351
M. C. B. Auto. Air: Parke Slack Adjuster for ... 260
Westinghouse Air Pump and Valve ... 612
Braking Power with Electric Traction ... 13
Bridges: Cannich, Scotland, Accident ... 330
Darling Harbor, N. S. Wales, Ottewell's Design ... 441
Duluth Draw, Competitive Designs for ... 395*
Gour Noir Viaduct, France ... 166*
Hawarden, England ... 246
Highway: Cantilever, Roanoke, Va ... 530
Frankfort, Germany, Failure of ... 586
Leer's Design ... 255
Round Timbers ... 428
Rainsville, Ind., Accident ... 255
Stearns' Truss for ... 52, 255
Jacksonville, Fla., Caisson for ... 604
Luka, Bosnia ... 331
McComb's Dam, Moving Draw Span ... 152
Memphis: Central Span ... 250, 252*
Deck Span ... 250
Elevation ... 251
Expansion Joint ... 511
Intermediate Span ... 252*
Mt. Vernon, O., Viaduct ... 197
Orb, France, Accident ... 291
Pacific Coast, Bad Construction ... 86
Plate Connection, Value of Rivets ... 518
Plate Girder: Baltimore Street, Cumberland, Md., Highway ... 65
Swing, Dismal Swamp Canal ... 417, 420*
Portable, Germany ... 208
Rainsville, Accident ... 255
Rotherhithe, London ... 593
San Miguel, N. M., Abutment Undermining ... 192
Stearn's Truss ... 52, 255
Stettin, Germany, Removal of Pier ... 32
Victoria, Stockton-on-Tees, England ... 222
Worcester, Mass., N. Y., P. & B. R. R., Iron and Ballast Floor ... 386
Bridge Members, Rivet Diagram for ... 258
Bridge Piers. See Piers ... 116
Briquette, French Cement Tests ... 583
Bucket Fire Extinguisher ... 183
Building Stones, Tests of English ... 279, 281
Buildings: Mill, Details ... 444*
Timbering for ... 78
Steel Skeleton, Larimer Columns for ... 89
Xylolith, Wood-Stone ... 90
Bumping Post, Ellis ... 334
Butt for Testing Justin Projectile ... 104

C

Cable Railways: Lauterbrunnen Muerren, Switzerland ... 385
Otis Elevating, Catskill Mts.
Floor System ... 165
Hoisting Machinery ... 228*
Profile ... 162
Trestle ... 161, 220
View ... 220
Wheel Governor ... 221
Caisson, Jacksonville Bridge ... 604
Canals, Protection of Banks ... 237
Cars: Brienz & Rothhorn Rack Ry ... 554*
Coal, Chicago, Rock Isd. & Pacific Ry. Standard ... 132*
Freight, Springs for ... 462
Passenger: Gate for World's Col. Exp ... 463
"Ohio," Balt. & O. R. R ... 29
World's Col. Exp., Ill. Cent. R. R ... 464*
Car Couplers. See Couplers ... 389
Car Mover, Q. & C ... 379
Car Replacer, Street Railways ... 138
Car Springs, Freight ... 462
Car Wheels: Contracting Chill for ... 345
J. N ... 353
Machine for Testing Effect of Brakes on ... 351
Casting, First in America ... 509
Cattleguards: Automatic Surface ... 411
Standard, No. 5 ... 476
Cement Jointed Cast Iron Pipe ... 235
Cement Tests, Grip and Briquette for, France ... 583
Chimney, Peoria, Ill., Water-works ... 36*
Coal Car, C., R. I. & P. Standard ... 132*
Coal Tipple, Dunlow, W. Va ... 414
Coaling Station, New Buffalo, Mich., Conveyor Plant ... 431
Cock, Hopper, Self-Closing ... 333
Cofferdams: Baltimore St. Bridge, Cumberland, Md ... 93
Wakefield Street Piling ... 260
Collar for Tapping Pipe ... 380
College of Engineering: Madras, India ... 90
Thomason, India. See Eng. Schools ... 454
Columns: Foundations for, Chicago ... 344
Gordon Formula for ... 464
Larimer ... 89
Compressed Air Engines ... 176
Comptometer ... 573
Concrete Arch, 59 ft. span ... 451
Concrete Depositing Bag ... 379
Conduit, Barkley, for Electric Ry ... 380
Converter, Bessemer, Surface Blowing ... 242
Conveyor Plant, New Buffalo, Mich., Coaling Station ... 434, 435
Couplers: Althouse ... 380
M. C. B. Auto., Buhoup's Device ... 187
Cribs: Two-and-a-half-mile, Chicago Water-works ... 243
Four mile, Chicago Water-works ... 243
Chain Conveyor, New Buffalo Coaling Station ... 434
Chicago, Proposed Clearance of Tracks in ... 55
Chill, Contracting, for Car Wheels ... 305
China, Map of Telegraph Lines and Railways ... 458
Curves, Transition: Street Rys ... 542
Location of ... 611

D

Dams: Austin, Tex., Colorado River, 152, 290, 303, 440
Concrete Masonry, Butte City, Mont ... 554
Intake Cover Valve ... 584
Flow of Water over ... 440
Fanning's Diagram ... 152, 304
Frizell's Diagram ... 290
Herschell's Section ... 440
Unwin's Diagram ... 592
Turner's Falls, Mass., Flow of Water over ... 440
Vyrnwy ... 146, 157
Zuyder Zee, Cross-section ... 243
Derrick, Galveston, Artesian Well ... 122
Dividers, Proportional, "Universal" ... 296
Division Box, Cucamonga Irrigation ... 291
Drainage Canal, Chicago, Map of Route ... 410
Drainage: Kankakee Marsh, Map of ... 410
Mexico, Standard Heading for Tequixquiac Tunnel ... 93
Drawbridges: Darling Harbor, N. S. Wales, Ottewell's Design ... 441
Duluth, Competitive Designs ... 396*
Hawarden, England ... 247
McComb's Dam, Moving of Draw Span ... 152
Plate Girder, Dismal Swamp Canal ... 417, 420*
Dredges: Atlas, "Alameda" ... 136
Bowers, "Anaconda" ... 137
Bowers, "Python" ... 138
Bucyrus Co. for Trestle Filling ... 100
Lake Pontchartrain Trestle, N. O. & N. W. R. R ... 100
Von Schmidt, Oakland, Cal ... 176
Dredging, Pacific Coast ... 136
Drifts on Railways ... 602
Drills: Artesian Well, Galveston, Tex ... 125
Electric Diamond ... 178
For Tapping Hole of Blast Furnace ... 427
Marvin Electric Percussion ... 172
Schuttler, Continuous-Acting Ratchet ... 318
Driving Shaft, Stow Flexible ... 129
Dump Wagon, Austin ... 212

E

Earth Handling, Lidgerwood System ... 316
Earthquake, Japan, Effect on Railway Track ... 170
Electric Mining Machines ... 59
Electric Motor, Van Zile's Traction Car ... 218
Electric Percussion Drill, Marvin ... 172
Electric Railways: Barkley Conduit for ... 380
World's Col. Exp ... 372*
Station ... 353
Electric Traction: Diagram Braking Power ... 13
Van Zile's Device ... 218
Elevated Railway: Electric, World's Col. Exp., Station ... 363
Liverpool, Hobson's Floor ... 400
Elevators: Reno Continuous ... 148
Sprague-Pratt Electric ... 482
Ellipsograph ... 472
Embankments: Canal, Protection of ... 237
St. Paul ... 187
Engineering Schools of the United States: Diagram of Graduates ... 113
Diagram of Number of Graduates in Several Courses ... 130
Diagram of Number of Graduates, Civil Eng. Schools ... 161
Diagram of R. P. I. Graduates Am. Soc. C. E ... 595
Time Distribution Diagrams for Various Courses ... 327
Engineering Schools, India: Thomason College ... 454
Madras ... 99
Engines: Boston High Duty Pumping ... 588*
Pump Valve ... 578
Compound: Indicator Diagrams from Different Types ... 377
Westinghouse, Indicator Diagrams from ... 378
Pneumatic ... 176
Traction, see Traction.
Triple Expansion Vertical, Strong's ... 270, 272
Worthington High Duty Indicator Diagram ... 75
Equationer ... 524
Excavations, Brace for Supporting Sides of ... 5
Expansion Joint, Memphis Bridge ... 511
Extensometer, Johnson's ... 115
Eye-Bars, Test of Full Size ... 40

F

Fenders: Sir Geo. Cayley's, for Railway Trains ... 269
West End Street Ry., Boston, Recommended ... 402
Field Table Sheet for Plotting Topographic Surveys ... 80
Filter Beds: Holland, Germany, England. Sewage, Summit, N. J ... 74, 544
Filter Plant: Crewe, England ... 257
Worms, Germany ... 231
Filter Press, Sludge, East Orange, N. J ... 520
Fire Extinguisher, Bucket ... 183
Floats, Landing Materials at Kotonow, Africa ... 320
Floor, Hobson's, Liverpool Overhead Railway ... 400
N. Y., P. & B. R. R. Bridge ... 386
Flume, Water Power, Colo ... 461
Flywheels, Strains in ... 535
Foundations: Baltimore Street Bridge, Cumberland, Md ... 64
Columns, Chicago ... 344
Cylinder, Victoria Bridge ... 223
Hawarden Bridge ... 246
Machinery Building, World's Columbian Exposition ... 9
Francis, Jas. B., Portrait of ... 266
Frog, Vaughan Spring Rail ... 355
Furnaces: Open-Hearth, Tipping ... 242
Wellman Iron & Steel Co ... 343

G

Gages: Hook ... 296
Recording Pressure ... 547
Garbage Cremators ... 523
Gate for Passenger Cars, World's Columbian Exposition ... 463
Geological Strata, Galveston Artesian Well ... 123
Glass, Wire-strengthened ... 90
Gordon Formula for Columns ... 464
Governor, Eiffel Tower Elevators ... 221
Greenland, Map Showing Peary's Route ... 249
Grip, French Cement Tests ... 583
Guns: Brown Segmental Wire Wound ... 484
U. S. Govt. 12-in Mortar ... 524

H

Heating, Hot Water, Curtis Regulator for ... 90
Hoisting Machinery, Otis Elevating Ry ... 228*
Hook Gages ... 296
Hopper Cock, Self Closing ... 338
Hydrant, Irrigating ... 293

I

Illumination, Diagrams of Distribution of ... 495
Incline Railway, Lauterbrunnen & Muerren ... 385
Indicator Post for Water Valves ... 58
Inlet Tower, Liverpool Water Supply ... 148
Iron Ore, Diagram of Production U. S., 1872-91 ... 424
Irrigation: Cucamonga Fruit Land Co ... 292
Western U. S., Map Showing Location ... 305

J

Joints: Cement for Cast Iron Pipe ... 235
Expansion, Memphis Bridge ... 511
Pipe ... 209
Rail (See Rail Joints).

K

Kankakee Marsh, Drainage of ... 410

L

Lake, Vyrnwy ... 146
Levee Protection, New Orleans, La ... 596
Level, for Steel Tapes ... 183
Lighting, Diagram of Distribution of ... 495
Locomotives: American and English, Weights of ... 375
Brienz & Rothhorn Rack Ry ... 554*
"Charles Dickens," London & Northwestern Ry ... 158
Compound: C. R. R. of N. J., Record Breaker ... 531
Consolidation, N. S. Wales Govt. Ry ... 297
Compound and Simple, Indicator Diagrams ... 6
English and American, Weights of ... 376
Grasshopper, B. & O. R. R ... 30
Oil Burning, Oroya Railway, Peru ... 175
Purdue University on Heavy Grade ... 273
Road, See Traction Engine
Simple and Compound, Indicator Diagrams ... 6
Steam Jet Smoke Consumer, M. C. R. R ... 40
Ten-wheel, N. S. Wales Govt. Ry ... 267
Twelve-wheel Freight, L. & H. R. Ry ... 12
Wheel Loads, English and American ... 376

M

Machine Shop, "Weaving Shed," Roof ... 568
Magnetic Ore Separator, Chase ... 290
Manholes, Sheepshead Bay, N. Y ... 308
Maps: Irrigated Lands in Western States ... 306
Kankakee Marsh ... 410
Lancashire, Derbyshire & East Coast Ry ... 26
London Railways ... 487
Railways of New England and Lower Canada ... 103
Railway Construction: 46; Far Western States ... 540*
44; Northwestern States ... 108*
45; Southwestern States ... 348*
Railways and Telegraph Lines, China ... 458
Meter, Venturi ... 16
Mill Buildings: Details ... 444*
Details of Press and Bending Shops, 447, 448, 449
Mining Machines, Electric ... 59
Mining Tunnel, Clement ... 134
Mortar, U. S. Govt. 12-in ... 534
Motor, Daimler Petroleum ... 498

N

New York Rapid Transit, Standard Plans, 492*, 516*
Niagara Falls Water Power, Map of Schemes ... 489
Nut Lock, Fougere ... 573

O

Oil Burning Apparatus, for Locomotives, Oroya Ry ... 175
Ore Separator, Chase Magnetic ... 290

P

Pavements, Diagrams of Mileage of Different Class in U. S ... 2
Petroleum Motor, Daimler ... 498
Photometer, Trotter ... 454
Piers: Hawarden Bridge ... 245
Iron Cylinder, Screw Piles ... 116, 288
Masonry, Renewal of ... 242
Screw Pile, Kotonow, Africa ... 553e
Landing Floats ... 529
Pile Driving: Diagram of Movement of Pile Under Blow ... 412
Diagrams of Values of Various Formulas ... 399, 439
Piles: Charring Before Creosoting ... 201
Creosoted, in Teredo-infested Waters ... 201
Failure of Overdriven ... 543
Screw: for Bridge Piers, India ... 116
For Sinking Cylinder Pier ... 253
Kotonow Pier, Africa ... 324*
Piling, Sheet, Wakefield, for Cofferdams ... 260
Pipes: Diagrams of Discharge and Velocities from ... 127
Diagrams of Head Lost, Fanning ... 42
Gas and Water Collar for Tapping ... 380
Sewer, Joints of ... 257
Water: Cast Iron, with Cemented Joints ... 235
Lead-lined Iron ... 586
Spiral Riveted, Colorado ... 461
Pipe Computer, Cox ... 582
Pipe Joint, for Soft Ground ... 209
Pipe Wrench, Ide ... 81
Plotting Surveys, Field Table Sheet for ... 80
Pneumatic Engines ... 176
Pressure Gage, for Low Pressures ... 547
Pressure Regulator, Acton's Hydraulic ... 171
Projectile, Justin, Test of ... 104
Proportional Dividers, "Universal" ... 296
Pumps: Boston High Duty ... 588*
Centrifugal, on Traction Engine ... 387
Dean Vertical Sinking ... 525
Pump Valve Mechanism: Boston High Duty Engine ... 578
Pumping Station, Peoria, Ill., Waterworks ... 64

R

Rack Railway, Brienz & Rothhorn ... 560, 564*
Rails: Girder ... 225
Indian Railways ... 614
100-lb., Penna. R. R ... 56
London & Northwestern Ry ... 207
N. & W. Ry ... 532
Prussian State Rys ... 474
Street Railways: with Concave Base ... 138
Wear of ... 225
Tests of Continuous ... 388
Rail Brace, Pressed Steel, Weir Frog Co ... 21
Rail Chair, London & Northwestern Ry ... 207
Rail Joints: Bridge, Price's ... 345
Churchill, N. & W. R. R ... 532
Price ... 346
Prussian State Rys., New Standard ... 474
Testing Continuous Rail ... 388
Triple Fish ... 175
Railways: Balt. & Ohio: Board Tree Tunnel ... 31
Grasshopper Locomotive ... 30
Passenger Coach ... 9
Chicago, Rock Id. & Pacific, Standard Coal Car ... 132

The symbol * denotes that the illustration is printed on inset sheet.

Chicago Union Transfer, Map 234
China, Map of 459
Clearing Snow from 602
Del. & Hudson Canal Co.s, Earth Hand Hog 316
Intramural, World's Col. Expos. 372*
Lanc. Derbyshire & East Coast, Map of ... 26
Liverpool Overhead, Floor for 400
London, Map of 487
London & Northwestern, Crewe Fitter Plant 237
New England and Lower Canadian Provinces, Map of 103
New York Rapid Transit: Design for Structures 516*
Standard Plans 492*
Of the World, Mileage of 570
Philadelphia & Reading, Map of System. 426
Turkey in Asia, Map of 556
U. S. and Foreign, Mileage 1880-90 571
Western Dummy, World's Col. Exp 372*
Railway Construction, Far Western States 540*
Northwestern States 108*
Southwestern States 348*
Railway Crossing, Stewart Ave., Chicago.. 282
Railway Cut, Sicily 261
Railway Embankment, Sicily 261
Railway Track: Japan, Effect of Earthquake on 170
Protection of, Sicily 261
Chicago, Proposed Clearance of 55
See also Track.
Railway Trains: Sir G. Cayley's Fender for 269
Rainfall: Boston, Diagram 365
Diagram of Maximum, Northeastern and North Central States 67
Rapid Transit: London, Map of Railways.. 487
New York, Design for Structures 516*
Standard Plans 492*
Ratchet Drill, Schuttler 318
Reducing Valve, Acton's 171
Refuse Destructors 523
Rensselaer Polyt. Inst., Graduates in Am. Soc. C. E 395
Reservoirs: Peoria, Ill., Water Works 36*
Reservoir Wall, Regensburg, Germany .. 429
Rifle, Krag-Jorgensen 329
Rivet Diagram, Edge Moor Bridge Works. 258
Rivet Values 518
In Web Splices 134
Road Locomotives. See Traction Engines
Roof, "Weaving Shed" for Machine Shops 568
Roof Truss, Diagram of Strains 126
Road Rollers: Aveling & Porter, with Compound Engine 227
Pope Reversible 473
Rock Drill, see Drills 427

S

Scraper for Boiler Tubes 237
Screw Pile Pier, Kotonow, Africa 324*
See also Piles.
Seaport, for Los Angeles, Cal 86
Sea-wall, Masonry, New York Harbor 559
Sewage Purification: Coney Island, N. Y., Plan of Works 368
East Orange 520
Long Branch, N. J 580, 581
Marlborough, Mass 180*
Medfield, Mass 611
Sheepshead Bay, N. Y 300*
Manholes 308
South Framingham, Mass 128
Summit, N. J 545
Wayne, Pa 422
White Plains, N. Y 276*
Details of Tanks 314
Sewer Pipe, Vitrified, Joints for 257
Shaft, Stow Flexible 129
Shafting and Prime Movers 206
Shop, "Weaving Shed" Roof 568
Signaling, Kinsman Block System, Brake Applying Apparatus 297
Slack Adjuster, Parke, for Air Brake. 260
Sludge Presses: East Orange, N. J. 520
Long Branch Sewage Works 580, 581
Smoke Consumer, Steam Jet, M. C. Railway 40
Snow Plows and Scrapers 602
Sounding Device, James 225, 326
Splices, Web, Value of Rivets in 134, 518
Springs for Freight Cars 462
Stations: Broad Street, Philadelphia, Pennsylvania Railroad, Plans .. 321, 338
Cologne, Germany, Train Shed for 333
Fortified, Lahore, India 196
Middletown, N. Y 604
New Orleans, La., Ill. Cent. RR., Train Shed for 506
New York Rapid Transit 492*
World's Col. Exp. Elevated Electric 363
See also Terminals.
Steamship "Eider," North German Lloyd, View of Hull 39
Steam Shovel, Barnhart, D. & H. C. Co.'s R. R 316
Steam Trap, Curtis 476
Steel: Bessemer Converter for 242
Diagram of Fluctuation in Prices, Pennsylvania 79
Open Hearth, Furnace for 242
Stone: Apparatus for Measuring Elasticity of 280
Building, Strength of 279
Street Car Fenders 269, 402
Street Railways: Car Replacer for 138
Fender, West End, Boston 402
Rail with Concave Base 138
Transition Curves 542
Submarine Sentry, James 226, 326

T

Tank, Locomotive Tender, Wabash R. R. 521
Tape Level 183
Tapes, Steel, Lufkin 561
Tapping Collar for Pipes 380
Telegraph Lines, China, Map of 458
Temperature Regulator, Curtis, for Hot Water Heating 90
Tender, Locomotive, Wabash R. R. 521
Terminal Improvements: Chicago 55
Washington, D. C., Penna R. R 57
See also Stations.
Thermometers, for Taking Temperature of Rail 389
Thomason Engineering College, India 454
Throttle Closing Apparatus, Kinsman 297
Tie, Metal, Kinnear's 524
Tie Plates: Goldie 475
Indian Railways 614
Timbering, Heavy, New Methods in 78
Tipple, for Coal, Dunlow, W. Va 415
Tool Box, Locomotive Tender 521
Track: Brienz & Rothhorn Rack Ry 564*
Japan, Effect of Earthquake on 170
London & Northwestern Ry. Rail and Chair 267
See also Railway Track.
Track Drill, Schuttler 318
Traction Device, Van Ziles 218
Traction Engines: Compound 27
Firebox for 507
Gearing for 507
With Centrifugal Pump 387
Truck, Standard Freight, Ill. Cent. R. R.. 465*
Trainsheds: Broad St. Station, Phila., Penna R. R 338
Plan 321
Cologne, Germany 332
New Orleans, La 506
Trap, Curtis Return Steam 476
Travelers: Kotonow Pier 324*
Manufactures Building, World's Col. Exp. 84*
Cologne Trainshed, Germany 333
Trestle Filling, With Dredge, Lake Pontchartrain 100
Truss, Stearns, for Highway Bridges.. 52, 255
Tunnels: Baltimore & Potomac, Ventilating Plant 362
Board Tree, B. & O. R. R 81
Chicago Four-Mile, Plan and Profile 236
Clement Mining 134
New York Rapid Transit 492*
Niagara Water Power 614
Sicily, under Timeto Torrent 261
Tequixquiac, Mexico Drainage Work.. 93
Turbine, Atkin's 592

U

"Unloader" Lidgerwood, D. & H. Canal Co, R. R 316

V

Valves: Hydraulic Reducing 171
Intake Cover, Butte City Dam 584
Water, Indicator Post for 58
Ventilating Plant, Baltimore & Potomac Tunnel 362
Venturi Meter 16
Viaducts: Gour Noir, France 156*
Movements of Arches 151
Mt. Vernon, O 197

W

Wagon, Austin Dump 212
Waste Weir, Butte City Dam 554
Water: Flow of in Pipes, Diagrams of Discharge and Velocity 127
Flow over Dams 152, 290, 302, 440, 592
Water Mains, Diagram of Friction Head, J. T. Fanning 42
Water Meter, Venturi 16
Water Power, Niagara Falls 489, 614
Water Power Flume, Granite Mt., Colo .. 161
Watershed, Boston Water Supply, Diagrams of Yields 66
Water Supply: Boston, Map of Drainage Areas 98
Liverpool, Norton Water Tower 148
Profile of Pipe Line 149
Vyrnwy Dam and Lake 146
Water Tower, Norton, Liverpool Water Supply 148
Water-Wheel, Atkin's 592
Water-Works: Chicago: 2½ and 4 mile Cribs 243
Four-Mile Tunnel, Plan and Profile 236
Peoria, Ill., Details of Pumping Station.. 39*
Reservoir Details 36*
Schuyler, Neb., Driven Well Plant 193
Wells: Artesian, Plant for Drilling, Galveston, Tex 122
Driven, Schuyler, Neb 199
Well Driving Plant on Wheels 572
Well Sinking Machinery, Galveston, Tex.. 124
Wheel Governor, Eiffel Tower 221
Wind Stresses, Mill Buildings 451
Wire Glass 90
Wire Winding Machine, Brown Wire-Wound Gun 455
World's Columbian Exposition, Electric Elevated Ry.: Details 372*
Station 363
Gate for Passenger Cars 463
Machinery Building, Foundations 9
Manufactures and Liberal Arts Building, Comparative Cross Section 194
Details 204*
Purlins 219
Roof Truss 195
Traveler 84*
Map of Transportation Systems 359
Special Passenger Car, Ill. Cent. R. R. .. 468*
Transportation Building, Details 608*
Wrench, Pipe, Ide 81

X

Xylolith in Building Construction 90

Z

Zuyder Zee, Map of 243

GENERAL INDEX

A

Accidents: Bridge and trestle 1, 73, 97, 145, 169, 193, 217, 289, 313, 337, 361, 385, 409, 433, 457 481, 505, 529, 577
Barret, Minne., St. P. & Sault Ste. Marie Ry 255e
Cannich, Scotland 330
Crankfort 586
N. Y. C. R. R 217, 577
Harlem River Draw 577
Rainsville, Indiana, Highway 255e
Highway 289
Licking River 134e
Orb, France 290
San Miguel, N. Mex 198
Strathglass, Scotland 330
Falsework, G. N. R 385
Licking River Bridge 116
Burning of Cars, England 169, 409, 444e
Cave-in 1
Dam, Honey Lake, Cal 529
Embankment, Giving Way of, St. Paul, Minn 121, 187
Explosion: Boiler 557
Car Heater 505, 577
Dynamite 457
Gun Cartridge on the "Philadelphia" 357
Gunpowder 313, 481
Loco. Boilers, see Accidents, Railway.
Fire: in Chicago Athletic Club, 433, 494e. 511, 516, 567
In Coal Mine, Dunbar, Pa 370
Flywheel 289
Landslides and Washouts 511
Powder Mills, Schagticoke 313
Pumping Engine, Brooklyn 577
Railway, British, 1891 ..... 36, 212
Collision: C. R. R. of N. J 553
Clapham, England 444e
Crossing, Steam and Street Railway. 361
Engineman Fined for 255
Fitchburg R. R 265, 373e
L. S. & M. S. Ry., Vermillion, O 61c
Northeastern Ry., England 409, 433, 444e
Phil. & Read 385
Penna. R. R., Harrisburg 12e
Thirsk, England 409, 433, 444e
Vermillion 61c
English 241
Flagging 241
Freight Trains Partially Braked 489
India 124
Loco. Boiler Explosions.. 169, 313, 457, 5-9, 601
New Jersey 121
Oil Lamps in 289
Open Draw, N. Y. Central 217
Switch Moved by Train 241
Street Railway Crossings 313
Grade Crossing, Erie R. R 540e
U. S.: July 1, 25, 49, 73
August 97, 121, 145, 169
September 193, 217, 241, 251, 265, 289
October 313, 337, 361, 385
November 409, 433, 457, 481
December 505, 529, 553, 577, 601
Responsibility of Employee for 12e
Retaining Wall 25
Sewer Gas 254
Sewer Trench 1
Shipwreck, "Western Reserve, Lake Superior 348e
Stand Pipe 193
Steam Engine 250
Steamship Collision 166
Street and Steam Railway Crossings 313
Trestle Sinking, D. & H. R. R 505
Tunnel: Cave-in 3-7, 481
Fire in Coosa 169
Vermillion, O., Collision 61c
Water Mains 217, 577
Water Tank 251
Wreck of Steamer 251, 348e
Accounts, Street Railway 394
Aeration of Water 94
Aeration, Effect on Natural Waters 183
Agriculture and Iron Making 395
Air Lock, Pneumatic, Victoria Bridge, England 223
Air Pump Westinghouse 612
Air, Measurement of Velocity in Pipes 584
Air Ship 573
Alaska, Schwatka's Explorations of 442
Alloys: Electrical Resistance of 394
Iron and Chromium 395
Manganine 501
Nickel 443
Aluminum 94
Boats, Racing 583
Building 289
Cooking Utensils 504
Amalgamated Association, Waning Power of 339
American Engineering and Inspecting Association 48
American Society of Civil Engineers: Library 419
List of Colleges from which Members Graduated 375, 471
Members, graduates of R. P. I 595
Nationality of Members 437
Nominations for Officers 347
Practice of Members 401
President Cohen's Address 7, 25, 36e
Publication Rules 13e
American Society of Mechanical Engineers: President Loring's Address, the Steam Engine 533, 540e
Ammeters 258, 276e, 283
Ammonia, Sulphate of, from Blast Furnaces, Utilization of 395
Analysis, Chemical, Causes of Discrepancy 347
Aqueduct, Liverpool Water Supply 148
Arches: Concrete, 50 ft 451
Gour Noir Viaduct 149
Masonry, Movements of Crown due to Temperature 151
Mt. Vernon Viaduct 197
Wrought Iron, Stockton-on-Tees, England 222
Architects: and Engineers 587
Naval, Association of 529
Architecture, Comparative 443
Arc Lamps, Low Tension 265
Arctic Expeditions. See Expeditions.
Arid Region, Future of 132e
Armor Plate: Curved 333-433
Harvey, Tests of 108e
Tempering 333
Tests 169, 333, 363, 433, 529
Bethlehem 529
Harvey Nickel Steel 108e, 116, 339, 433
Turret 481
U. S. Navy 429, 433, 481
Army, U. S., Report of Chief of Engineers 596
Artesian Wells, See Wells.
Asphaltic and Bituminous Products, Nomenclature of 291, 350c
Asphalt and Bitumen 291
Asphalt Lining for Reservoirs 572
Association: of Naval Architects and Naval Engineers 529
Western Traffic 150
Atmosphere, Chicago 374
Axles, Defective: on Locomotives, 84e, 134c, 159

B

"Bacillus" Cement 350e
Bacteria and Pure Water 180e, 6c3
Ball Bearings: Scouttler Drill 318
Sprague-Pratt Elevator 482
Uses for 444e
Balloon, Navigable 573
Baltimore College, Damage by Tunnel .. 121
Bar, Charleston, Depth of Water on 350c
Basic Steel: Cast, Pittsburg 79
Southern States 58
"B. C." and "K. C." 470c
Beams, Wooden, Load for 230c
Bearings: Ball: Sprague-Pratt Elevator.. 482
Uses for 444e
Carbold Oilless 614
Fiber-Graphite 614
Roller, Meneely 289, 422
Pressure on 370
Bell Rope 289
Belts, Driving 5 8
Bessemer Pig: Cast, Pittsburg 79
Southern States 58
Bicycle, Speed Record 289
Bidders, rights of 286
Bitumen and Asphalt 291
Black Print Paper, Direct Positive 524
Blast, Large Rock 357
Blast Furnace: Rock Drill to Open Tapping Hole 427
Warwick Iron Co 371
Blasting, Rock, American 419, 443, 467
Block System 392
Argentine Republic 141
Kinsman's Automatic 297, 301e
N. Y. Central R. R 97, 145, 536, 549
P. R. R 357
Rochester Electric Railway 361
Standard Rules 355, 373e, 379
Blue Printing in Cloudy Weather ... 564e, 569
Boats: Racing, Aluminum 583
Submarine, Baker 457
Boilers: Automatic Stokers and Forced Draft 512
Explosion of, Worcester, Mass 557
Feeder, Van Auken 68
Feed Water Heater, "City of Paris" 111c
Feed Water Purifying 296, 577
For Steam Drills 597
Marine, Best Type of 539, 563
Scale in 293
Scraper for Tubes 237
Setting of Wellman Iron & Steel Co., Thurber, Pa 342
Tubes for, Mannesman, New Type 117
Wellman Iron & Steel Co 342
Borings for Prince Edward Id. Tunnel ... 481
Boulevard: Chicago 49
Philadelphia 529
Boundary, Pennsylvania, Delaware 514
Brace: Dunn Extensible, for Sewer Excavation 5
German, Trench 237
Brakes: Accidental Release of 241
Accidents Due to Mixing 489
Auto. Air: Bills for Compulsory Introduction 72, 304
Boluss 433
Illinois 76
Laws to Hasten Introduction 304e
M. C. B. Committee on Tests 276e
New York and Westinghouse, Tests on N. Y. C. & H. R 351c
Parke Slack Adjuster 260
Westinghouse New Air Pump and Valve 612
Continuous, England 577
Effect of on Car Wheels 351
Engine Trucks, O. C. R. R 361
England 577
Freight, Statistics, 1892 577
India 123, 326
Possible Power of, with Electric Traction 13e
Steam, in India 326
Released by Frost Carbureter Connection 241
Vacuum: England 577
India 123
Westinghouse: England 577
Improved 577, 588, 612
New Air Pump and Valve 612
vs. New York 251
Brake Power for High Speeds 541, 577, 588
Brake Shoes: Congdon 289
Corundum 289
Wood Faced 360
Brake Tests: N. Y. C. & H. R 251, 351c
Westinghouse 577, 588
Breakwater, Cuxhaven, Germany 125
Brick: Consumption of in New York 213
Paving 265, 456, 494, 596
Rate of Laying for Paving 309
Brickwork, efflorescence on 10
Bridges: Arthur Kill, Foundation 77
Authorship of Plans for 446c
Barret, Minn., W. P. & Sault St. M. Ry., Failure of 255c
Bosnia State Ry 331
Brooklyn: Terminal 73, 289
Receipts 553
Traffic on 140, 553
Buffalo 286
Cannich, Scotland, Failure of 330
C. R. R. of N. Jersey, Easton, Pa 531
Combination 323 347
Contracting for, England and U. S 572
Darling Harbor, New So. Wales 165
Term of Competition 298
Dismal Swamp Canal Plate Girder Draw 417
Draw, New York 313
English Railway 501
Duluth Draw, Competitive Designs 390
East River 289, 357, 409, 481, 505
English Channel 141
English Draw 501
Folding 313
Gour Noir Masonry Arch 149
Hawarden, England 149

Highest..... 357
Highway: Cantilever, Roanoke, Va..... 530
Cumberland, Md..... 63
Lansing, Mich..... 385
Frankfort..... 586
Leavenworth, Kan..... 53
Rainsville, Ia., Accident..... 255c
Round Timbers..... 428
Stearns Truss for.....53, 111c, 255c
Wooden..... 289
Hudson River.....289, 501, 553 597
Inverted Bowstring, Bosnian State Railways..... 331
Jacksonville, Fla., Pneumatic Caisson... 604
Lachine..... 425
Lansing, Mich., Highway..... 385
Licking River, Ky., Accident..... 116
Louisville & Jeffersonville..... 265
Luka, Inverted Bowstring Truss..... 331
Macomb's Dam, Moving Draw Span..118, 151
Memphis, Tenn..... 135
Deck Span and Central Span..... 250
Expansion Joint..... 511
Mt. Vernon Viaduct..... 197
New York & New Jersey.....289, 553, 597
Ninth St., Pittsburg, Pa..... 347
North River..... 501
Omaha, Neb..... 357
Orb, France, Derailment on..... 291
Ottawa River..... 425
Paint for..... 419
Plate Girder, N. Y., P. & B. R. R., Iron and Ballast Floor..... 386
Norfolk & Western R. R..... 417
Portable..... 208
Poughkeepsie..... 56
Railway, Symposium on Use o Steel for Rivet Diagram for Pin Connections in. 25
Roanoke, Va., Cantilever Highway..... 530
Rotherhithe, London..... 593
Ruhr River, Germany..... 357
San Miguel, N. Mex., Failure of..... 198
Scalaquada Creek..... 286
Schuylkill, New, Philadelphia..... 457
Stearns Truss for.....53, 111c, 255c
Steel vs. Wrought Iron..... 184
Strathglass, Scotland..... 330
Suspension, for flume..... 457
Unsafe, California..... 86c
Victoria, Montreal..... 425
Victoria, Stockton-on-Tees, England..... 222
Web Splices.....131c, 157c, 206c
Wooden..... 419
Wooden Highway..... 289
Wrought Iron vs. Steel..... 184
Bridge Bids, Buffalo..... 286
Bridge Building, England and U. S.....572, 588e
Bridge Designing, Whistling Process..... 129
Bridge Floors: Iron and Ballast, N. Y., P. & B. R. R..... 386
Thin..... 275
Bridge Members, Rivet Diagram for..... 258
Bridge Piers, Screw Piles for..... 116
Bridge Suits, Phœnix Co..... 265
Broadway Franchise Sale..... 492e
Bucket Fire Extinguisher.....183, 252e, 374c
Buckle Plates..... 371
Building, Aluminum..... 289
Buildings: and Foundations, Chicago..... 343
Artificial Cooling of..... 12e
Boston Laws..... 44
Chicago Fireproof, Fire-Test of, 433, 494c, 567c, 511, 516e
Factory, Lighting of..... 564e
Foundation, Chicago..... 349e
Fireproof, Fire Test of.433, 494c, 511, 516e, 567c
Heavy Timbering for..... 78
Homestead Steel Works..... 446
Iron, Wind Strains in..... 542c
Heating and Ventilating..... 514
Larimer Column for.....89, 111c
Machinery Hall, Paris..... 195
Sooysmith, System of Construction..... 343
Steel Skeleton, High, Buffington patents on..... 553
Stones for, British, Strength of.....279, 300e
World's Col. Exp. See World's Columbian Expos.
Xylolith (Wood-Stone)..... 99
Bumping Post, Ellis.....334, 506

C

Cables: Brooklyn Bridge Ry..... 49
Life of Street Railway..... 213
Submarine: Australia and British Columbia..... 337
California to Sandwich Islands..... 117
Pacific Ocean..... 337
Cable Railways:..... 162
Catskill Mountains, Otis Elevating.141, 162, 220
Compound vs. Simple Engines for..... 123
Cost Compared with Electric..... 404
England..... 552
Genoa..... 501
Lauterbrunnen-Muerren..... 365
Los Angeles, Cal..... 213
Mount Vesuvius..... 182c
Operation of..... 394
Otis Elevating, Catskill Mountains....141, 162
Hoisting Machinery and Safety Clutches..... 220
Pasadena & Mount Wilson..... 40
vs. Electric..... 394
Washington..... 406
Cable Traction for Rivers..... 141
Cableway..... 41
Cable Wheel, Hauling Over Streets..... 409
Caisson, Large, in Germany..... 125
Pneumatic, Jacksonville, Fla..... 604
Calculating Machine..... 538
"Call," Meaning in Land Surveying..... 278c
Cams, Cutting..... 537
Cameras at the World's Fair..... 324e
Canada and England..... 424
Canada; Annexation of..... 424
Mineral resources..... 424
Race Problem..... 132e
Railway statistics..... 195
Canadian Notes..... 424
Canals: Amsterdam—Merwede.....193, 237
and Railways, comparative cost..... 533
Baltic and Black Sea..... 454
Cape Cod.....385, 553
Cascade, Oregon..... 262
Chesapeake & Del..... 177
Chicago Drainage, 90, 102, 121, 169, 241, 265, 301, 432, 477, 481, 505, 528
Columbia River..... 361
Corinth.....169, 409
Cost of..... 553
Danube and Oder..... 567
Dismal Swamp..... 118
Electric Boats for..... 385
Erie Traffic..... 121
French..... 525
Hennepin.....355, 289, 429
Ireland.....60c, 86c, 204e
Irrigation, India..... 442
Lake Erie & Hudson River..... 601
Manchester Ship.....169, 180, 238, 245, 298, 587
Cost above Estimates..... 180e
Merwede, Holland.....193, 237
N. Y. and Phila..... 1, 66
New York State.....97, 160, 241, 265, 409
Electric Traction for..... 385
Nicaragua..... 457
Consulting Engineers' Report..... 558
Status in 1892..... 554e
Panama.....195, 433
Concession..... 433
Disclosures.....609e
In French Court..... 516e
Platte River Water Power..... 612
Protection of Banks, France and Holland 237
St. Mary's Falls..... 597
Sault Ste. Marie traffic..... 517, 597
Schuylkill..... 433
Ship, Irish Proposed.....60c, 86c, 204e
Soulanges..... 456
Water Power, Platte River..... 612
Canal Convention, Erie & Hudson..... 601
Cantilever Supports for a Swing Span..... 441
Capitol, Sewerage and ventilation of..... 429
Car Company, Pullman..... 374
United States..... 390
Car Couplers: Althouse..... 380
Automatic: Bills for Compulsory Introduction.....73, 300e, 334
Buhoup's Patent..... 187
Illinois..... 76
New York..... 361
N. Hampshire R. R. Com. on..... 251
Safety of..... 322
Statistics, 1892..... 577
Dangers Due from Handling Different Types..... 309e
German..... 141
Car Heating: Appliances..... 48
Electric..... 425
England..... 477
Hot Water, Ireland..... 557
vs Steam..... 421e
Instruction in..... 241
Steam.....299, 306, 514
Valve for..... 384
vs. Hot Water..... 421e
Stove.....290, 361
Car Lighting: Electric, Ireland..... 557
Midland Ry..... 169
Gas.....48, 149, 169, 538, 557
England.....169, 409, 444e
India..... 149
Ireland..... 557
Heat Generated by..... 538
Oil, in Accident..... 289
Pintsch..... 141
Car Mover, Q. & C. Co.'s..... 379
Car Replacer, Street Railways..... 138
Car Sill Repairs and General Averages, 132e, 324e
Car Truck, Barnes'..... 274
Car Wheels: Cast Iron, Cause of Cracks.. 331
Contracting Chill for..... 305
"Comby," M. C. B., Std..... 324e
Journal Friction..... 134c
Car Works: Ohio Falls Car Co..... 408
U. S. Rolling Stock..... 360
Cars: American..... 131
and English..... 433
Cost of..... 288
Buffet..... 288
Coal, C., R. I. & P. Ry..... 139
Canadian..... 425
Color of..... 370
and Temperature, India..... 165
Communication Between Compartments..... 405
Construction of..... 131
Corridor, English..... 601
Cost of..... 288
Dining, English..... 601
Dump..... 228
Electric: Liverpool Overhead Ry..... 193
Street Indicator..... 587
English.....134, 155, 433, 432, 601
1st, 2d and 3d Class..... 133
For 124-ton gun, P. R. R..... 405
Freight: American..... 577
Automatic Couplers and Brakes, Statistics, 1892..... 577
Lubrication of..... 598
Sill Renewals..... 132e
Defects of.....323, 514
French, Cost of..... 409
Illinois Central R. R..... 192
India..... 501
Italian Railways..... 39c
Kitchen..... 601
N. Y., N. H. & H. R. R..... 425
Palace and Sleeping..... 134
Passenger, N. Y. Central..... 528
World's Fair, Ill. C. R. R.....192, 462
Heating and Ventilation of, M. C. B. Assoc..... 180e
Private, Wagner Palace Car Co..... 99
Pullman..... 374
England..... 377
Refrigerator, English..... 537
Relief, on Indian Railways..... 501
Shocks to, by Rail Joints..... 166
Sleeping.....168, 336, 477
English..... 477
Jones..... 168
Staten Island Rap. Transit..... 94
Storage Battery.....49, 250, 385, 388, 425
Sioux City..... 250
Washington..... 406
Street..... 49
Suburban..... 94
English Plan..... 462
Unloading Earth from, Lidgerwood System..... 317
Van Ziles' Electric.....218, 254c
Ventilation of..... 180e
England..... 180
Vestibule, Bancroft..... 360
Barr..... 384
Wagner.....99, 107, 425
World's Col. Expos.....462, 480
Carboid Bearings..... 614
Casting, First in America..... 509
Cathedral, St. John the Divine, Controversy over Plans..... 192e
Cattleguards: Automatic, Surface..... 411
Standard, No. 5..... 476
Standard, Tes. of..... 360
Cement: Bacillus of..... 350e
Canadian..... 426
In Sea Water..... 350
Joints for Water Pipe..... 39c
Mortar, Effect of Heat on..... 38c
Portland, for Packing Rings..... 442
"Sand"..... 213
Tests: Less Known..... 111c
Effect of Cushioning Grips..... 583
Sieves..... 38c
White Florida..... 182c
Census Bulletin No. 196. Telephone interest..... 73
Centrifugal Force in Rims of Fly Wheels 535
Chain Conveyor, Chic. & W. Mich. Ry..... 434
Channel, Deep Water, Buffalo to Detroit, Duluth and Chicago..... 600
Charleston Bar, Depth of Water..... 350e
Chicago: Politics in Engineer's Dept..... 181e
Railway Terminals..... 60e
Tendencies of Growth of..... 349e
Chicago, Water Supply, "Scribner's" Article..... 420e
Water Supply and Typhoid Fever..... 300e
Drainage, Capacity of Channel..... 174
Foundations..... 349e
Sanitary Condition..... 601
Chill, Contracting, Cooled by Compressed Air..... 305
Chimney, Steel..... 457
China, Telegraph Lines and Railways in.. 448
Cholera:.....418, 529, 573
And Drinking Water..... 204e
And Immigration..... 252e
And Quarantine..... 276e
And Sanitation..... 374e
Providence, R. I..... 348e
And Water Supply, Germany..... 529
As a Sanitary Agent..... 300e
Hamburg..... 573
Prevention of Infection..... 529
Chromium in Iron..... 595
Cipher Writing, Typewriter for..... 145
City Engineers, Ownership of Records..... 36c
City Hall, Philadelphia..... 542
City Improvements, Baltimore, Md..... 513
Civil Engineer vs. Mule..... 606
Closets, Dry..... 514
Coal: Argentine Rep..... 443
Bituminous, Electricity in Mining..... 57
Nova Scotia..... 392
Schuylkill Valley, Pa..... 377
Coal Breaker..... 371
Coal Car; Chicago, Rock Is'd & Pacific..... 139
Coal Conveyor, West Buffalo, Mich., Chic. & W. Mich. Ry..... 434
Coal Mine: Fire in..... 370
Maple Hill..... 371
Coal Product, India..... 237
Coal Supply and P. & R. Lease..... 10
Coal Tipple, Dunlow, W. Va..... 414
Coaling Ships at Sea..... 529
Cock, Self-Closing, Hopper..... 353
Cofferdam, Baltimore Street Bridge, Cumberland, Md..... 63
Colleges of Engineering: Madras, India..... 99
Poorkee, India..... 454
U. S. See Engineering Schools of U. S.
Colliery, Maple Hill..... 371
Color, Effect of on Temperature of Cars.165, 370
Colorado Desert, Future of..... 132e
Columbian Centennial Celebration, New York..... 372c
Transportation at..... 374e
Columns: Larimer Steel.....89, 111c
Discussion of Gordon Formula for..... 461
Commerce, Great Lakes.....261, 278c
Companies, Laws of Incorporated..... 227
Compressed Air: for Cooling Chills..... 305
Use of..... 175
Motor, Judson..... 110
Power, New York.....64, 505
Supply, New York..... 505
Computation..... 573
Comptometer, Graphical and Numerical.. 254c
Concrete; Arch, 50 ft..... 451
Base for Pavement, Cost, Toronto..... 309
Cost, in Harbor Works..... 245
Depositing Bag..... 379
Conduit System, Barkley, for Electric Railways..... 380
Electric Railways.....380, 601
Conduits; Water, Rochester, N. Y..... 553
Syracuse, N. Y..... 384
Congresses: a World's Col. Exp.....398c, 426e
Internal Navigation..... 323
Consulting Engineers, Ethics of Practice. 444e, 494c, 517e, 564e, 567, 608e
Contract Prices and Cost of Labor and Material..... 86c
Contracting Chill Cooled by Compressed Air..... 305
Contractors: Liability for Increase Over Estimated Cost..... 108e
U. S. Govt. and 8 hour Law.132e, 135, 145, 155e, 214, 241
Converter, Bessemer, Surface Blowing..... 242
Conveyor Plant, New Buffalo, Mich., Coaling Station..... 434
Copper Refining by Electrolysis..... 70
Copper Wire..... 299
Corrosion: of Lead Pipes by Electric Currents..... 273
Tunnel Lining..... 475
Water Pipe..... 615
Cotton Waste, Soap from Refuse Oil..... 94
Coulomb Meters..... 283
Couplers, See Car Couplers.
Cranes: Dockyard..... 138
Electric..... 69
Traveling, Some Defects in..... 586
Portsmouth Dockyard..... 138
Creosoting and Charring Piles..... 291
Creosoting Works, Galveston..... 408
Cribs, Chicago Four-Mile Tunnel..... 245
Crowds, Transportation of..... 374e
Crushers and Rolls for Iron Ore..... 70
Culverts.....203, 419
Currents, Ocean, Tests of..... 501
Curvature, Designation of Points ...476c, 542c
Curves, Transition: Laying out.....562, 610c
Street Railways.....451, 542c
Cutter, Revenue..... 201
Cylinder Pier, Sinking with Screw Piles.. 233
Cylinders, Collapsible, for Raising Ships.. 361

D

"Da," Textile Material..... 221
Dams: Austin, Tex..... 152
Fanning's Report..... 152
Flow of Water Over.290, 360, 301, 440, 446, 592c
Frizell's Criticism of Fanning's Report 303
Butte, Mont., Concrete Masonry..... 554
Cheap, Roanoke River, Va..... 370
Cornell, New York City.....1, 23, 169, 240, 598
Croton..... 1, 23, 104, 169, 249, 598
Rejection of Bids..... 104
Flow of Water Over.... 290, 300e, 304, 440, 446
Gibsonville, N. Y..... 1
Guadarrama River, Spain..... 596
Housatonic River.....553, 587
Rio Grande River..... 214
Sewall's Falls, N. H..... 145
Topeka, Kan.....477, 505
Turner's Falls, Flow of Water Over..... 440
Vyrnwy, Liverpool Water Supply.146-147, 156e
Factor of Safety..... 157e
Supervision of, Need for..... 12e
Zuyder Zee, Holland..... 243
Decimal System, England..... 608e
Derrick, Floating..... 389
Desert, Colorado..... 363
Diamond Drills..... 371
Discharge of Pipes, Error in Diagram..... 133
Distribution Mains and Fire Service..... 61
Ditch, Drainage.....312, 466, 576
Dividers, Proportional, "Universal"..... 296
Diving for Treasure..... 256
Docks: Avonmouth, England..... 477
Bristol, England.....357, 477
Southampton.....326, 477
See Dry Docks.
Dockyards: Portsmouth..... 155
Lifting and Hauling Appliances..... 138
Drains, Track..... 203
Drainage: Chicago, 25, 90, 97, 102, 121, 169, 241, 265, 301, 420e, 432, 457, 481, 505, 528
Capacity of Channel..... 174
Ditches..... 576
Illinois..... 44
Kankakee Marsh, Ill.....410, 421
Lake Angeline, Mich..... 505
Laws, Texas..... 255
Madison Co., Ill..... 466
Mexico..... 476
Tequixquiac Tunnel..... 93
Miccosukee Lake, Fla..... 93
New Orleans..... 214
Drawbridges: Darling Harbor, N. S. W., Ics 441
Duluth, Competitive Designs for..... 301
Ensish..... 561
Hawarden, England..... 66
Macomb's Dam, Moving Span..... 151
Plate Girder, Dismal Swamp Canal, N. & W. R. R..... 417
Stettin, Germany, Removal of Pier..... 32
Dredges: Atlas..... 136
Bowers, "Anaconda"..... 136
"Python"..... 136
Bucyrus, Dimension of Hull, Correction. 206c
Clamshell..... 115
Hercules, Endless Chain..... 116
Hopper, Ceylon..... 271
Scoop..... 415
Trestle Filling, N. O. & N. W. R. R..... 101
Von Schmidt..... 156
Dredging: Great Lakes.....525, 577
Low Bid for..... 577
Pacific Coast.....115, 136
Drills: Diamond..... 371
Electric.....69, 171, 178
Marvin Percussion.....171, 178
Rock, for Tapping Blast Furnace..... 371
Schuttler Continuous Acting Ratchet..... 318
Steam, Boiler for..... 597
To Open Tapping Hole of Blast Furnace. 427
Driven Wells, Schuyler, Neb..... 199
Driving Boxes, Loco..... 607
Driving Wheels: Large..... 247
Mast. Mech. standard..... 597
Droughts, Prevention of..... 328
Dry Docks: Brooklyn, N. Y.....94, 98, 193
Chicago..... 214
Port Royal, S. C..... 40
Port Townsend..... 601
Puget Sound.....25, 264, 336
Timber, Brooklyn..... 94
Spanish..... 145
Dump cars..... 288
Dump wagon, Austin..... 212
Dynamic Possibilities..... 238e
Dynamite cruiser, "Vesuvius"..... 529
Dynamo, Efficiency of..... 538

E

Earth Handling, Lidgerwood Method..... 316
Earthquake, Japan, Distortion of Ry. Track..... 170
Economics, Railway..... 217
Eight Hour Law, Government Contracts, 132e, 145, 156c, 214
Elasticity of Building Stones.....279, 300e
Apparatus for Measuring..... 280
Electric Cars, Power of..... 3.3
Electric Currents, Corrosion of Lead Pipes by..... 273
Electric Decoration, Washington..... 326
Electric Drill, Edison.....171, 178
Electric Elevator, Sprague-Pratt..... 482
Electric Heaters.....425, 588e
Electric Lamps: Cost of..... 597
Edison Patents.....313, 597
Life and Cost of.....433, 597
Westinghouse..... 181
Electric Light: and Power, Hamilton, Ont. 286
Edison Patents..... 313
Economy in..... 260
Edinburgh, Scotland..... 160
England..... 209
Geneva, Switzerland..... 357
Hammerfest..... 160
Low Tension..... 265
Madrid..... 596
New York..... 265
Penn. R. R. Tracks..... 573
Quebec..... 427
Statue of Liberty..... 169
Stations..... 65
Towers for..... 603
Washington..... 326
Wire Installation..... 211
Westinghouse Lamps..... 381
Electric Meters.....276c, 283
Electric Mining Machines..... 50
Electric Motors: Storage..... 25
Electric Plant, Auditorium..... 313
Electric Power..... 193
Electric Power Transmission. See Power Transmission.
Electric Railways: Barkley Conduit System for..... 380
Braking Power..... 132
"Bucking" in Motors..... 51
Chicago & St. Louis..... 542
Chicago Stockyards..... 357
City & So. London..... 49
Coming Development of..... 20, 33
Cost Compared with Cable..... 404
Conduit.....380, 406, 601

e, Editorial; c, Correspondence.

Cost of Motors ... 393
Employees ... 299
English, Conduit ... 601
Glasgow ... 422
Growth of ... 393
Heavy Work on ... 289
Lansing, Mich ... 289
Little Rock, Ark., Power Station ... 563
Liverpool Overhead ... 400, 494
London ... 49, 409, 486, 492
Proposed ... 486, 492e
Underground ... 409
Love Conduit ... 601
Machine Shops for ... 393
Mine, in Hungary ... 530
Model Roadbed ... 402
Montreal ... 21
Municipal Control of ... 455
New York ... 385
Operating ... 394
Ottawa ... 425
Perfect Overhead Construction of ... 428
Perry's Series System ... 51
Pasadena & Mt. Wilson ... 40
Philadelphia ... 455
Recent Improvements in ... 307
Rheostats on ... 51
Rochester, N. Y. ... 299, 361
Block System on ... 361
Russia ... 140
San Francisco, Counterbalance Arrangement on ... 193
Second Ave., N. Y. ... 385
Signals for Crossings ... 394
Singapore ... 615
Sioux City ... 259
Standards for ... 394
Storage Battery ... 406
New York ... 36e
Street Indicators ... 587
Toronto ... 426
Track for ... 307, 402
Trolley System ... 299
United States ... 227
Underground Wiring for ... 549
Van Zile's System ... 228e
vs. Cable Railways ... 394
Washington, D. C. ... 406, 601
Washington & Great Falls ... 157c
World's Col. Exp. ... 340, 362
Electric Resistance of Metals and Alloys ... 394
Electric Search Lights ... 251, 337, 374
Chicago ... 374
"Statue of Liberty" ... 251
Electric Stone Crusher ... 165
Electric Storage Battery Cars ... 49, 313, 285, 406
Electric Storage Batteries ... 313
Electric Traction ... 51
Recent Improvements in ... 307
Electric Train Signal ... 289
Electric Transformers ... 298
Electric Traveling Cranes, Some Defects in ... 566e
Electric Welding, Carriage Factories ... 453
Electric Wire Regulation, Paris ... 369
Electric Wires, Safe Installation of ... 211
Electrical Engineers, Standing of ... 52
Electrical Measuring Instruments ... 258, 283, 295
Electricity: in Coal Mining ... 50
In Tanning ... 66
Grounding on Water Pipes ... 587
Long Distance Tranmission of ... 52
Railway Shops ... 69
Electrolytic Refining of Copper ... 50
Electroplating ... 69
Elevated Railways: Baltimore, Md ... 455
Brooklyn, N. Y. ... 25
Chicago, Lake St. ... 477
Chicago Stockyards ... 337
Chicago and S. Side ... 1
Electric, World's Col. Exp. ... 340, 362
Liverpool, England ... 400, 494
Manhattan ... 374e, 385, 477, 529
Columbian Celebration ... 374e
New York ... 374e, 385, 477, 529
Tracklaying on ... 385
Philadelphia ... 232, 439
Elevators: Reno Continuous ... 180e, 188
Sprague Pratt Electric ... 482
Ellipsograph, Valden's ... 472
Embankment, Breakage of, St. Paul, Minn ... 187
Engineering: Early, on New England Railways ... 497
Experimental ... 202
India, Expensive ... 109, 594
Improvement of Profession, Present Status ... 538
Notes, Pacific Coast ... 86c
Schools in India: Madras ... 99
Thomason College, Roorkee ... 454
Engineering Schools of the United States: Agricultural Land Grant ... 28
Am. Soc. C. E. Membership, 375, 401, 472, 519, 595
Rensselaer and Massachusetts Inst. Tech ... 472, 519, 595
Civil Engineering Schools, Number of Graduates ... 161
Colleges of Civil Engineering ... 161
Columbia College School of Mines ... 139
Cornell University ... 87
Cost of Technical Education ... 546
Courses in Mining Engineering ... 414
Professor Munroe's Letter ... 488
Cutting Recitations ... 256
Degrees Conferred ... 232, 256
Demand and Supply of Engineers ... 111
Distribution of Graduates ... 139
Distribution of Time ... 268, 327, 518
Electrical Engineering ... 185
Lawrence Scientific School ... 207c
Lehigh University, Division of Time ... 355
Length of Course ... 231
Mass. Inst. of Technology ... 65, 139
Graduates in Am. Soc. C. E. ... 472, 519
Membership of Graduates in Am. Soc. C. E. ... 375, 471
Names, Addresses and Courses of Different Schools ... 114
Nationality of Members of Am. Soc C. E. ... 437
Notes on Colleges not included in Tables ... 186
Number of Civil Eng. Graduates ... 139
Number of Mech. Eng. Graduates ... 139
Number of Mining Graduates ... 139
Polyt. Coll. of Pennsylvania ... 438
Present Occupation of Engineering Graduates ... 354
Requirements for Admission ... 210
Rensselaer Polyt. Int.: and Am. Soc. C. E. ... 472, 519, 595
Division of Time ... 355
Graduates in Am. Soc. C. E. ... 472, 519, 595
Hours of Work ... 302
Reorganization of Lawrence Scientific School ... 277e
Schools of Mechanical Engineering ... 186
Sheffield Scientific School, Number of Post-Graduates ... 302
Engineering Courses ... 233
Sibley College, Cornell Univ. ... 87
Stevens Institute of Technology ... 65
Studies, Civil Eng ... 327
Mech. Eng ... 327
Min. Eng ... 327
Thayer School of Civil Engineering ... 488
Correction ... 438
Total Graduates from All Schools ... 112
Union College, Hours of Work ... 328
University of Illinois, Correction ... 438
Degrees ... 328
Univ. of Mich ... 6
Vacation Work ... 256
Westn. Univ. of Pennsylvania ... 269
Engineering, World's Col. Exp ... 219
Education at ... 428
Enginemen, Pay of, Italian Railways ... 39c
Engines: Gas or Gasoline ... 106
Petroleum, Priestman's ... 200
Steam: Compound and Simple, Tests of ... 53c
Compound: Steam Distribution ... 377
Vs. Simple, for Cable Railways ... 123
Westinghouse ... 572e
Steam Distribution ... 378
Efficiency of ... 419
President Loring's Addre-s to Am. Soc M. E ... 537, 540e
Pumping, Osaka, Japan ... 611
Quadruple Expansion ... 409
First Stationary ... 470c, 542c, 567c
Triple Expansion ... 337
Boston High Duty ... 578, 589e, 590c
Davidson, Brooklyn Water-Works ... 561
Strong's Vertical ... 271
Traction ... 580
England ... 586
Use of ... 396e
Engineers: and Architects ... 587
And Politicians ... 181e
Line, U. S. Navy ... 542e
On Water Commissions ... 396e
Consulting, Ethics of Practice. 44e, 491c, 517e. 5 4e, 567, 608e
Demand for and Supply of ... 111
English, and Economical Construction ... 189e
Marine, Association of ... 529
Equationer ... 524
Esplanade, Toronto ... 25, 425
Ethics of Consulting Practice, 44e, 494c, 517e, 561e, 567, 608e
Evaporation, Experiments, Mt. Hope Reservoir ... 604
Excavating in Damp Ground for Explosives ... 73
Excavation, Sewers, Extensible, Brace for ... 5, 337
Excursions, Railway, Beginning of ... 107
Exhaust Nozzle, Size of, Locomotives ... 38c
Exhibition, American at Cape Town ... 250
Expansion of Continuous Rails ... 388, 394e
Expansion Joint, Memphis Bridge ... 511
Expedition: Alaska, Schwatka's ... 442
Arctic, Franklin Search ... 442
Nansen's ... 494, 601
Peary's ... 219, 242e 310
Explosive: Apyrite ... 385
For Excavating ... 73
High, Justin Projectile, for ... 104
Guns ... 433
Randite ... 189
Unreliability of ... 300e
Export Trade, Extension of, in America ... 561e
Exports, Breadstuff ... 73
Expositions: Paris ... 195
Machinery Hall ... 195, 218
Space at ... 218
World's Col., see World's Columbian Expos.
Extensometer, Johnson's ... 114
Eye-Bars, Steel, Tests of ... 40

F

Farms in Maine ... 141
Fast Runs: Bicycle ... 289
Chic. & Alton R. R. ... 553
"City of Paris" ... 385
Phil. & Read. R. R. 97, 525, 531, 541e, 588e, 952
Torpedo Boat ... 165
P. R. R. ... 429
Railways ... 541e, 588e
Transatlantic Steamers ... 385
Feed Water, Purifying ... 296
Feed Water Purifier, Bradley's ... 577
Feed Water Heater, "City of Paris" ... 111c
Worthington ... 111c
Feind, Bernhard and Chicago Politics ... 181e
Fencing Railway ... 240
Fenders: Sir G. Cayley's, for Railway Trains ... 269
Street Car ... 121
Rept. of Mass. Comm ... 402
Ferryboat, Steel. C. R. R. of N. J ... 94
Fertilizer, Slag Phosphate ... 371
Field-Table Sheet for Plotting ... 80
Filter Beds: England, Germany and Holland ... 74
Filter Plant, Crewe, England ... 257
Philadelphia ... 1, 214
Worms, Germany ... 221
Filters, Sand: and Cholera Infection ... 529
In Feed Water ... 577
Filtration, Decatur, Ill ... 298
Fire: Chicago Athletic Club Building, 433, 494c, 511, 516e, 567c
Extinguisher, Bucket ... 183, 252e, 374c
Parrish Coal Mine ... 370
Fire Service: and Distribution Mains ... 42, 61
Madison, Wis ... 81
Fire Streams, Height and Discharge ... 135c
Fire Test of Chicago Fireproof Building, 433, 494c, 511, 516e, 567c
Fixtures, Connected with Sewers ... 457
Floods, Illinois ... 197
St. Paul, Minn ... 121, 187
Recent ... 130
Floors, Bridge, Hobsons ... 400
Deadening sound in ... 213
for Machine Shops and Factories ... 564e
Hobson Patent, Liverpool Overhead Ry ... 400
Flume, Timber ... 457
Flywheels, Strains in Rims of ... 535
Flying Machines ... 97
Foliage on Streets ... 529
Forced Draft ... 512
Wells an Iron & Steel Co's Boilers ... 342
Forestry, American ... 35, 73
Bill ... 156e
Formula, Approximate, for Friction head in pipes ... 15c
Fort Washington, Potomac River ... 214
Foundations: Arthur Kill Bridge, Staten Island ... 77
Bay State Gas Co.'s Tanks ... 76
Bridge ... 247
Chicago Buildings ... 343, 349c
Cylinder, Victoria Bridge, England ... 223
Foundry, Steel ... 489
Franchise, New York Rapid Transit Ry., Sale of ... 492e
Francis, Jas. B ... 266, 276e
Freight House, Chicago Terminal ... 94
Friction, Car Journals ... 134c
Friction Head, Fire Hose and Pipe ... 43
Frog, Vaughan Stiff Spring Rail ... 355
Fuel Consumption on Railways ... 76, 289
Fuel Gas Values ... 364
Birmingham, England ... 165
Fuel: Crude Oil, Minneapolis Water-Works ... 75
Locomotives, So. America ... 433
Molasses ... 193
Petroleum, for Locomotives ... 174, 433
Solid, Liquid and Fluid ... 539
Fullers Earth ... 337
Furnaces: Open Hearth, Tipping ... 242
Wellman Iron & Steel Co ... 343

G

Gage, Railway ... 83, 173, 425
Canada ... 102, 425
Change of, Gt. Western Ry ... 173
N. Y., P. & O. R. R ... 174
Gages, Wire and Plate, Standa d ... 537e, 588e
Garbage Cremation ... 25, 49, 198, 522, 553
Garbage Cremators: Different Types ... 522
Southampton, England ... 193
Garbage Disposal ... 319, 325e
Chicago ... 94, 553
New York City ... 313, 397e
Gas or Gasoline Engine, Pacific ... 106
Gas: Fuel, Values ... 364
Natural ... 121, 169, 361
Waste in City Offices ... 313
Weighing ... 490
Gas Lighting: Chicago ... 385
Inventor of ... 286
Gas Machine ... 432
Gas Mains, Collar for Tapping ... 380
Gas Meters, Register for ... 66
Gas Pipe, Joint for ... 209
Gas Tanks, Bay State Gas Company's Foundations ... 76
Gas Works, Tar from ... 419
Gasoline Engine, Pacific ... 106
Gate Valves, Finding by Magnet ... 134c
Gear Teeth ... 419
Gearing for Traction Engines ... 506
Girders, Web Splices on ... 206c
Glass, Wire, for Skylights ... 90
Gordon Formula, Discussion of ... 464
Government, Municipal ... 418
Governor, Shaft ... 537
Grade, 100 per cent ... 468e
Grade Crossings: Atlanta, Ga ... 266
Chicago ... 54, 282
Fair Haven, Ct ... 73
Stewart Ave., Chicago ... 282
Grades, Street ... 357, 457
At Street Intersection ... 182c 230c
Graduating Theses: Postponement of Date for Receiving ... 36e
Granulation of Iron Ore ... 40
Graphic Computation, vs. Numerical ... 254c
Graphite ... 274
Grate, Shaking, Richards ... 371
Greenland, Peary Expedition ... 243, 242e, 310
Proposed New Expedition ... 492e
Grip, Cement testing, Effect of Cushioning ... 583
Guns: American, Tests of ... 433
Brown, Segmental Wire-wound, 117, 165, 370, 371, 484, 598
Krag-Jorgensen Magazine Rifle ... 217
Krupp ... 10, 265
Nickel Steel ... 505
Wire Wound ... 117, 165, 370, 371, 484, 598
Springing of ... 357
Syndicate for ... 477
U. S. Army ... 429
U. S. S. "Monterey" ... 241
U. S. Navy ... 525
U. S. 12-in. B. L. Rifle ... 251
U. S. 12-in. Mortar ... 534
13-in. ... 313
Gun Carriage: Pneumatic Disappearing, 111, 169, 193
Roller Path for ... 313
Gun Works, Gatling ... 597

H

Harbor: Aransas Pass ... 265
Bourgas, Bulgaria ... 469
Charleston, S. C ... 241
Corpus Christi, Tex ... 117
Honolulu ... 501
Humboldt, Cal ... 528
Los Angeles ... 86
Philadelphia ... 505
Harbor Works, Cost of Concrete ... 245
Hardening Steel Tools ... 189
Harlem River, Proposed Filling of ... 84e
Harpoon, Electric ... 214
Head, Loss of, in 24-in. Stop Valve ... 117
Heat Engines, Possibilities of ... 251e
Heating: Hot Water and Steam, Curtis Regulator ... 90
High Speeds on Railways ... 541e, 588e
Highways, 49, 93, 178, 250, 265, 337, 357, 472, 436, 457, 467, 491
Canadian ... 426
Economical and Political Importance of ... 467
Indiana ... 613
Improvement ... 357
Highway Commission: Mass ... 250, 457
National ... 49
Highway Construction ... 491
Highway Conventions ... 178, 613
Highway Legislation ... 93
Connecticut, Proposed ... 170
Texas ... 265
Highway League ... 337, 442
Hoisting Engine, Four Drum ... 79
Hoisting Machinery, Otis Elevating Cable Ry ... 220
Homestead Troubles ... 37e
Hook-Gag Appliances ... 296
Hopper Cock, Self Closing ... 533
Hopper Dredge for Ceylon ... 271
Hose Jets, for Fire Service ... 42
Hose Nozzles, Discharge from ... 135c
Hydrants, Fire ... 61
Hydraulic Cushions for Dry Docks, Etc ... 217
Hydraulic Mining ... 361
Hydraulic Power, Australia ... 68
Hydraulic Pressure Regulator, Acton's ... 171
Hydraulic Rams ... 271
Hydraulic Works, India ... 594

I

Ice and Ice Making ... 130
Ice Making Machines, Measurements of Performance ... 18
Illinois, Railways in ... 76
Illumination, Distribution and Measurement of ... 495
Immigration ... 150, 65, 525
And the Cholera ... 252e
Restriction by Increased Passenger Rates ... 252e
Incline Railways: See Railways, Incline.
India: Bad Management of Government ... 594
Engineering Schools ... 99, 454
Indicator, Calkins ... 443
Indicator, Street, for Electric Cars ... 587
Indicator Diagrams, Simple and Compound Locomotives ... 6
Indicator Post for Water Valves ... 58, 97
Industrial Development of Schuylkill Valley, Pa ... 372e, 376
Injector, History and Development ... 370
Instruments, Surveying ... 532
Intake, Pipe, Chicago ... 73
Interlocking ... 72, 145, 392, 418, 529
English Railways ... 145
Hydraulic and Pneumatic ... 72
Illinois Laws ... 418
World's Col. Expos ... 529
Interstate Commerce Commission ... 241, 501
Annual Report ... 583, 601
Decisions of ... 358
Laws as to Brakes and Couplers ... 340c
Pooling ... 583
Inventions, Influence of Environment on ... 396e
Inventors and Buyers of Inventions ... 229e
Ireland, Loyalists and Others ... 204e
Iron: Magnetic, Croton Mines ... 81
Ontario ... 425
Purification of, from Sulphur ... 498
Tennessee ... 392
Tests of Southern Bridge ... 15c
Wrought, vs. Steel for Bridges ... 184
Iron and Steel: Exports, British, to the Colonies ... 141
Prices, Different Countries ... 44
England and America ... 44
Structural, Specifications for ... 111c
Iron Making in Relation to Agriculture ... 394
Iron Manufacture, Southern States ... 58
Iron Mines, Coe Hill, Canada ... 425
Iron Ore: Chase Magnetic Separator ... 199
Granulation of ... 40, 86c, 134c
Production, 1872-1891 ... 424
Iron Tunnel Roofs, Corro ion of ... 475
Iron Works, Chinese ... 505
Pottstown ... 371
Schuylkill Valley, Pa ... 372e, 376
Irrigation: Artesian Wells ... 342
Colorado Desert ... 363
Cucamonga Fruit Land Co., Cal ... 292
Growth of, in U. S ... 306e, 306
India ... 594
Report on ... 179
Spain ... 596
Value of ... 365
Washing on ... 761
Western U. S ... 389
Irrigation Canals, India ... 452, 518c

J

Jackets, Steam, Report on ... 466
Jarrah Wood for Paving ... 229e
Jetties: Charleston, S. C ... 241
Galveston, Tex ... 217
Joints, Cement, for C. I. Water Pipe ... 235
for Steam and Water ... 601
Joints, Masonry, Pressure on ... 419
Joule Meters ... 283
Journal Friction ... 132c
Judson "Threadless Screw" System ... 110
Justin Projectile, Tests of ... 104

K

Kankakee Marsh, Drainage of ... 410, 421e
Knight, Jonathan ... 36e
"Knots" and "Miles" ... 396e
Krupp's Works, Essen, Germany, Condition of Laborers E ... 276e

L

Labor, Brick Paving ... 250
English Railways ... 190
Labor Problem: Black's Suggestions ... 228e
Krupp's Works ... 276e
Modern ... 37e, 204e
Trade Unions in England ... 350c
Laborers and Employers, Present Situation ... 37e
Lakes: Angeline, Novel Drainage of ... 505
Great: and St. Lawrence Valley ... 278c
Commerce on ... 261
Deep Water Channel through ... 525, 577, 600
Hemlock ... 604
Rules for Proportioning Vessels on ... 348c
Miccosukee, Fla., Drainage of ... 93
Lake Front Litigation, Chicago ... 529
Lamps, Electric Incandescent ... 357, 433, 597
Cost of ... 597
Edison vs. Westinghouse Litigation, 237, 313, 597
Life and Cost ... 433
Signaling by ... 533, 597
Westinghouse ... 381, 597
Land Grant Railways, see Railways
Land Revenue System, India ... 594
Land Surveying, Meaning of "Call" ... 278c
Land Surveyors, Govt., Cape Colony, Africa ... 99
Larimer Column ... 80, 111c
Lathe Beds, Straws in ... 538
Latrobe, Benj. H ... 36e
Launches, Electric and Steam, World's Col. Exp ... 154
Launching War Ships ... 323
Laws: Eight Hour ... 241
Incorporated Companies ... 227
Highway and Drainage, Texas ... 265
Lawrence Scientific School, Reorganization of ... 277e
Lead in Salt Water ... 351c
Lead Coated Metal Plates ... 500
Leaks in Water Conduit, Rochester ... 505
Legal Decisions, 34, 152, 166, 234, 245, 267, 278, 291, 357, 388, 44, 472, 483, 569
Levees: Mississippi ... 121, 506
Wall for ... 121
Level, for Tape Measure ... 214
Leveling, St. Louis ... 183
Library: Am. Soc. C. E ... 158c
Congressional ... 419
Tilden Fund for ... 43

e, Editorial; c, Correspondence.

Light, Measurement of, Trotter's Paper.... 495
Lighthouses: Flash Light for..... 1, 583
St. Mary's River..... 214
Removal of Engineer..... 9
Telegraphing from, to Shore..... 529
Lighthouse Board, U. S., and Col. Wm. Ludlow..... 132e
Lightships, Iron..... 103
Line and Staff of the Navy..... 516e
Litho-carbon..... 217
Lock, Black Warrior River..... 337
Locomotives: Abt Rack, Compound..... 145, 481
Accidents to, Italian Railways..... 39c
American and English, Comparison of Weights..... 376
American, in New South Wales, 56, 131c, 159, 255c..... 267
American for Sweden..... 19
American for Holy Land..... 556
Argentine Republic..... 433
Baldwin, New South Wales, 56, 131c, 159, 255c..... 267
B. & O. RR., High Speed..... 60e
Burning of..... 588e
C. R.R. of N. J., High Speed..60e, 530, 541, 592
"Charles Dickens," Mileage..... 158
Compound..... 117
Abt Rack..... 145 481
and Simple, Comparison of Indicator Diagrams..... 6
B. B. & C. India Ry..... 75, 409
Central R.R. of New Jersey, Record Holder..... 60e, 530, 541, 592
Chicago & So. Side Rapid Transit..... 572e
Consolidation: N. S. Wales Govt. Ry's..... 267
Cooke..... 97
Elevated Railways..... 372e
English on P. R.R..... 429
Four-cylinder..... 384
India..... 75, 409
Johnstone's..... 117, 476, 576
Lehigh Valley..... 337
Lindner..... 97
Mexican Central..... 117, 476, 576
Penn. R. R..... 217, 429
Pike's Peak Ry..... 145, 477
P. & W. Ry..... 350
Suburban..... 72
Construction of..... 422
Defective Axles, American and English..... 84e, 131c, 159
Driving Wheels, Large..... 217
Driving Boxes..... 607
Electric..... 25
Elevated Railways..... 372e
English and American, Comparison of Weights..... 376
English, Old..... 103
English on Penn. R. R..... 429
Erie, with Painted Boiler Jacket..... 422
Fairlie, L. I. R. R..... 360
Freight, I. R. & H. B. Ry..... 7
Fuel for, South American..... 433
Fuel Consumption..... 280
Great Northern Ry., England, High Speed..... 60e
Heavy Passenger, M. C. R. R..... 288
U. P. Ry..... 350
High Speeds..... 541e, 588e, 592e
Rous-Marten's Views..... 60e
India..... 75, 409
India, Defective Axles on English..... 84e
Iron Range & Huron Bay Ry..... 7
Jaffa & Jerusalem Ry..... 556
Jacketing, Painted or Unpainted..... 422
Large Driving Wheels..... 253
Lehigh Valley Consolidation..... 337
Life of..... 587
Linaner..... 97
Mastodon..... 7
Mexican Central..... 117, 476, 576
Michigan Central..... 288
Mileage..... 158
Narrow Gage, Ireland..... 318
New South Wales..... 84e, 131c, 159, 267
N. Y. Central..... 251
High Speed..... 60e
Oil Consumption..... 607
On Heavy Grades..... 86c, 134c
Penna. R.R. High Speed..... 60e, 217, 429
Performance, L. & N. R. R..... 190
Petroleum Fuel for..... 174, 433
P. & R. High Speed..... 60e, 530, 541, 588
Pike's Peak..... 145, 477
Pittsburg & Western..... 350
Purdue University, on Grades..... 278c
Records and Dimensions of Several High Speed..... 60e
Road, See Traction Engines
"Rocket," Death of Builder of..... 417
Service, Length of..... 587
Shay Geared..... 370
Simple and Compound, Indicator Diagrams..... 6
Sizes of Exhaust Nozzles for..... 38c
Smoke Prevention on Mich. Cent. R. R. 40
Speed Tests on P. R. R..... 429
Standard, P. R. R..... 587
Standard, with Interchangeable Parts..... 587
Suburban..... 72
Suburban Tank, Ill. Cent. R. R..... 240
Sweden..... 49
Tenders, Wabash R. R..... 521
Ten-Wheel..... 288
Ten-Wheel, N. S. Wales Govt. Rys..... 267
Throttle Valve for..... 44
Twelve Wheel..... 7
Wear of Tires..... 337
West Shore R. R., High Speed..... 60e
When to Be Destroyed..... 587
Wood Burning..... 433
Works, Grant..... 125
New York..... 480
World's Col. Expos..... 204
Long and Short Haul..... 501
Los Angeles, Seaport for..... 96c
Lubrication, Freight Cars..... 508
Ludlow, Col. Wm., and U. S. Lighthouse Board..... 91, 132e

M

Machine Shops and Factories, Cranes for..... 508e
Machine Shops: for Electric Railways..... 393
With Wearing Shed Roof..... 508
Machinery of Atlantic Steamers..... 539, 555
Machinery Hall, Paris..... 195, 218
Magnetic Ore Separator, Chase..... 199
Mail Bags, Tarred..... 2-2
Mail Contract, Ocean..... 374
Mail Distribution Pneumatic..... 205, 333
Mains, Water Distribution and Fire Service..... 42
Manganese, Alloy..... 501
Mannesmann Tubes..... 111e
New Tyne..... 117
Manufactures, Boot and Shoe..... 130
Manure, Removal of..... 238
Market, Lima, Peru..... 216
Mars..... 322, 418
Marsh, Kankakee, Drainage of..... 110, 421e
Masonry, Cost of, Lock..... 337
Masonry Joints, Distribution of Pressure. 419
Master Car Builders' Assoc: Car Still Repairs..... 132e
Car Repairs..... 324e
Committees on Revision of Standards.. 276e
Heating and Ventilation of Passenger Cars..... 180e
Interchange Rules..... 132e
Standards..... 12e, 262
Measuring Instruments, Electrical..... 238
Metals, Electrical Resistance of..... 394
Metal Plates, Lead Coated..... 500
Meters, Electric..... 258, 276e, 285, 295
Joule..... 283
Meter, Venturi Water..... 16, 45
Neptune..... 107
Meter Register..... 46
Mica..... 226
Michigan, Engineering Notes from..... 428
Micro-Organisms in Water Supply..... 603
Mile Records: Bicycling..... 253e
Pacing..... 324e
Trotting, Nancy Hanks..... 253e
"Miles" and "Knots"..... 396e
Mill Buildings: Bad Construction..... 470e
Homestead Steel Works..... 446
Wind Strains in..... 470e
Mill Creek, Cincinnati..... 179
Mines: Canadian..... 425, 443
Coal, Maple Hill, Pa..... 371
Coeur d'Alene..... 1
Comstock, Frauds in Management..... 429
Croton Iron, Magnetic and Non-Magnetic Ore..... 81
Iron, Granulation of Ore..... 134c
Phosphate, Florida..... 15c
Surveying..... 83
Mineral, New "Litho-carbon"..... 217
Mining: Hydraulic, Litigation Over..... 393
Bituminous Coal, Electricity in..... 50
Mining Machines, Electric..... 50
Mining Tunnel, Cement..... 134c
Money, Novel Methods of Raising..... 457, 501
Monuments, a Question of..... 182c, 230c
Mortar, Cement, Effect of, Heat on..... 38c
Mortars: U. S. Army..... 429, 433
Carriages..... 384
12-in. Breech, Loading..... 534
Motors: Compressed Air for Street Railways, Judson..... 110
Gas, Connelly..... 97
Electric..... 69
Car, Cost of Parts..... 393
Petroleum, Daimler..... 498, 502c
Storage Battery..... 49, 259, 388, 406
Street Railway..... 49, 259, 388, 406
Ammonia..... 418
Compressed Air..... 405
Connelly..... 97
Steam..... 224
Mt. St. Elias..... 477
Municipal Expenses, Washington, D. C.. 393
Municipal Improvements, American Cities, Cost and Methods of Paying for.. 220
Municipal Loan, Baltimore..... 313
Municipal Ordinances, Chicago..... 25
Municipal Ownership of Street Railways.. 99

N

Nails, Cut and Wire..... 371, 501, 577
National Guard, Proposed Re-armament of..... 372e
Natural Gas: Chicago..... 361
Ohio..... 121
Ontario..... 169
Tennessee..... 121
Navigation, Internal..... 323
Navy, U. S..... 313-481
Civil Engineers in..... 542e
Court Martial..... 595
Line and Staff Officers..... 516e
See Warships.....
Navy Yards, U. S..... 481
New England Water Works Association; Publication of Papers..... 60e
Newspaper Delivering Machine..... 250
Nicaragua Canal Status..... 561e
Nickel Ores..... 443, 577
Nickel-in-the Slot Machine for Newspapers 251
Nordenfelt, Thorsten, and Maxim—Nordenfelt Co..... 249e
Notes and Queries, 111, 123, 326, 351, 374, 518, 567, 573
Notes From Recent Water-works Reports, 81, 494
Nova Scotia, Mining Resources..... 392
Nozzle Discharge..... 135c
Nut Lock, Fougere..... 573

O

Ocean Currents..... 501
Ocean Records, Steamship, (See also Fast Runs)..... 118, 121
Oil, Crude, Fuel, Minneapolis Waterworks..... 75
Oil Burning Apparatus Oroya Ry. Peru... 175
Oil Consumption on Locomotives..... 607
Oil Pipe Line, Georgia..... 381
Oil Trust, Standard..... 10
Omnibus, Pneumatic Tires, Glasgow..... 587
Operating Expenses, Street Railway..... 418
Ore, Iron..... 11, 425
Sweden..... 49
Nickel..... 443, 577
Iowa..... 577
Spathic..... 392
Ore Granulating Devices..... 11
Ore Separators..... 11
Chase Magnetic..... 199
Ore Transportation by Steamer..... 337
Otis Elevating Cable Ry..... 141, 162, 220
Ottawa, Canada, Notes on..... 425
Oxygen, Amount Contained in Reservoirs at Different Depths..... 393

P

Pacing Record, Mascot..... 324e
Packing Rings, Portland Cement..... 442
Paint for Iron Structures..... 419
Pan, Potous..... 230c
Paper, Uses of..... 536
Paper Maker, First German..... 418
Parks: Bryant, New York City, Proposed Site for Tilden Library..... 228e
Laying Out of..... 10
Patents: Incandescent Lamp..... 313
Storage Battery..... 313
Paving: American Cities..... 2
Asphalt: American Cities..... 2
Tires for..... 241
Cost of..... 186
Brick..... 178, 205, 285, 529
American Cities..... 2
Cost of..... 529
Day's Labor..... 250
Rate of Laying..... 309
St. Louis, Condemned..... 596
Cost of Concrete Base for..... 309
Damage by Heavy Loads..... 409
Granite Block..... 322
Guidet..... 322
Heavy Hauling on..... 446e
Maintenance of..... 539
Materials, Comparison of..... 494
Mileage of, American Cities..... 2
Prices, Varying..... 166
Sea Shell..... 69
Stone, American Cities..... 3
Street Railway Companies..... 505
Wood..... 229e
American Cities..... 2
"P. C." and "P. T."..... 470e
Peary Expedition to Greenland..... 249, 252e, 310
Petroleum: Argentine Rep..... 433
Engine, Priestman's..... 200
Fuel for Locomotives..... 174, 433
Motor, Daimler..... 498, 502c
Production, Russian..... 190
Philadelphia: Street Cleaning..... 441
Water Consumption..... 389
Phosphate Mining, Florida..... 15c, 193
Piers: Baltimore Street Bridge, Cumberland, Md..... 64
Hawarden Bridge, England..... 346
Masonry, Removal of, Stettin, Germany 32
Screw Pile, Africa..... 320
Sinking with Screw Piles..... 116, 233
Pig Iron: in New Zealand..... 44
Industry of the U. S..... 10
Pile Driving: Formula..... 18c
Uniform Practice in..... 398
Discussion..... 412, 460
Unreliability of Formulas for Particular Cases..... 541c
Piles: Charring Before Creosoting..... 201
Formulas for Load..... 230c
Over Driving, Effects of..... 543c
Safe Load for..... 469e
Screws: for Bridge Piers..... 116
Kotonow Pier..... 320
Sinking a Pier with..... 233
Sheet, on Rock..... 326c
Pillar, Stone, Heavy..... 529
Pipes: Cast Iron Water, Cement Joints for..... 235
Collar for Tapping..... 380
Corrosion, Athens, Greece, by Electricity 273
Water Pipe..... 615
Discharge of..... 193
Formula for Friction Head in, Cox..... 15c
Hydraulic Mining..... 491
Lead, Corrosion by Electric Currents.... 273
Lead-Lined Iron..... 586
Riveted Sheet Iron..... 494
Sewer, Cost of Laying..... 466
Manufacture of..... 473
Vitrified, Bursting Pressure..... 252e
Spiral Riveted, Hesperia, Cal..... 461
Gunnison Co., Col..... 461
Steel and Iron..... 237
Velocity of Air in..... 584
Vitrified, for Water Mains..... 252e
Vitrified Sewer, Strength of Joints for... 256
Water: Cement Joints for..... 39c
Cast Iron, Cost in Place at Great Falls, Mont..... 126
Relative Costs and Capacities..... 62
Wrought Iron and Cement..... 182c
Welded, Manufacture of..... 370
Wrought Iron: Intake for Chicago..... 73
Flanges, Standard..... 537
Pipe Computation, Cox..... 582
Pipe Joints: Cement..... 39c
Cement, for C. I. Pipe..... 235
Gas..... 209
High Pressure..... 477
Vitrified Sewer, Strength of..... 256
Pipe Line, Oil..... 381
Pipe Sewers, Dallas, Tex..... 518c
Diagram for Flow..... 126
Pipe Wrench, Ide..... 81
Plate Gages..... 537, 588e
Plotting, Field Table Sheet for..... 80
Pneumatic Engines..... 175
Pneumatic Tubes for Mail Distribution, 117, 265, 333
Politicians and Engineers..... 181e
Pooling, Opinions on Laws on..... 583
Population: Chicago, from School Census 108e, 468e
Colored, Southern States..... 89
Formula for Increase of..... 59
Foreign, of U. S..... 238
Philadelphia..... 595
Porous Pan..... 230c
Port, Bourgas, Bulgaria..... 409
Portsmouth Dockyard, Lifting and Hauling Appliances..... 138
Powder, American Smokeless..... 433, 525
Power and Force..... 134c
Power: Compressed Air, New York..... 61
Electric, Philadelphia..... 96
Lauffen to Frankfort..... 529
Portsmouth Dockyard..... 155
Power Co., New York..... 505
Power Distribution by Electricity..... 193
Power Station, Electric, Little Rock..... 563
Power Transmission: Electric..... 137
Albino, Italy..... 125
Frankfort..... 529
Geneva..... 120
Niagara to Buffalo..... 193
Portland, Ore..... 52, 118
Telluride, Col..... 52
Variable Speed..... 538
Pressure Gage, Recording, for Low Pressures..... 547
Pressure Regulator, Acton's Hydraulic.... 171
Prime Movers and Shafting..... 205c
Printing, Photographic, Black Prints..... 524
Problem in Railway Location..... 350c
Profit Sharing on Railways..... 214
Projectiles..... 241, 370, 395, 481, 523
Carpenter Steel..... 481
Chrome Steel, Test of..... 295
Justin..... 104
Steel..... 37
Velocity Measurement by Sound..... 241
Proportional Dividers, "Universal"..... 296
Proposals, Right to Withdraw..... 280
Publication Rules, Am. Soc. C. E..... 13e
Pulverizer, Ball's..... 11
Pumpage, Automatic Record of..... 73
Pumping, Electric Power for, Spokane Falls..... 237
Pumping Hot Water..... 111c
Pumping Engines: Davidson, Brooklyn Water-Works..... 561
Boston High Duty..... 578, 588c, 590c
Brooklyn, N. Y., Accident to..... 577
High Duty, Economy of..... 589e
McKeesport, Pa., Bids for..... 599
Osaka, Japan..... 611
Pumping Plant for Natural Gas, Ohio..... 121
Pumping Station: Sewage, Orange, N. J.... 145
Peoria Water-Works..... 58
Sydney, New South Wales..... 66
Pumps: Dean Vertical Sinking..... 525
Memphis, Tenn..... 202
Rubber, for Salt Water..... 477
Utilization of Head on Suction Side..... 540e
See Pumping Engines.
Punches, Spiral, Advantages of..... 466
Pyrites, Magnetic and Non-Magnetic, at Croton Mines..... 81

Q

Quarantine and Cholera..... 276
Quebec, Notes on..... 424

R

Race Tracks and Records..... 324e
Rack Railways: Abt: India..... 97, 393
Cost, Europe..... 95
Lebanon Mountains..... 556
Brienz & Rothhorn..... 121, 560
Raft, Timber..... 265
Rails: Breakage of..... 97
Breakage of, Denmark..... 24
British, Exports of..... 164
Continuous Expansion of..... 388, 396c, 446c
Electric Railways..... 404
India..... 4, 611
Indian State Railways..... 614
Light and heavy..... 202
L. & N. W. Ry., 90-lb..... 207
New England Railways..... 203
N. Y. Central, 100-lb..... 36
N. & W. R.R., 60 ft..... 145
Norfolk & Western RR., 60-ft., and Churchill Joint..... 532
Paper..... 536
Penna. R.R., 100-lb..... 56, 145, 216
Prussian State Rys..... 474
Relaying, Practice in..... 515
Report on..... 514
Rolling and Reheating..... 592c
Rounded Corners of..... 203
75-lb..... 614
South Florida Ry..... 480
Standard for Street Rys..... 113
Steel, Cost of Pittsburg..... 79
Street Railway, Concave Base..... 138
Wear of..... 97, 224
Rail Brace, Pressed Steel, Weir Frog Co.. 21
Rail Chair, L. & N. W. Ry..... 206c
Rail Fastenings, Report on..... 515
Rail Head, Standard, Street Railways..... 113
Rail Joints..... 35
Bridge, Fisher..... 175
Churchill, N. & W. R. R..... 532, 592c
Experiments on..... 116
Fastenings..... 157c
London & Northwestern Ry..... 205c
Price Girder..... 246
Prussian State R'ys..... 474
Report on..... 514
Rigid, English Railways..... 206c
Shocks of, to Rolling Stock..... 166
Tight..... 308, 405
Triple Fish..... 175
Railways and Canals, Comparative Cost.. 553
Railways and Good Roads..... 398c
Railways and Telegraph Lines, China..... 4-8, 194c
Railways: Africa..... 44, 94, 141, 165, 434, 500
Argent. Republic..... 45, 94, 110
State Management and Inspection..... 221
Atmospheric Propulsion Co..... 552
Australia..... 109c, 549
Baltimore & Ohio, Early History, President Cohen's Address to Am. Soc. C. E..... 7, 29, 36e
Beira..... 500
Broad Gage, Canada..... 423
Canada..... 97, 425
Statistics of..... 135
Notes on..... 424
To New England, Early..... 102
Canadian Pacific..... 425
Catskill Cable..... 141, 162, 220
Cheap, Pittsburg Southern..... 326c
Chicago, Rearrangement of Tracks..... 54
Stewart Ave. Crossing..... 282
Stockyard..... 337
Chicago & So. Side Elevated, World's Col. Exp..... 339
Chicago & St. Louis..... 542
Chicago & West Mich., Coal Conveyor.. 434
Chicago Union Transfer..... 44, 234
Chignecto Ship..... 214
Chinese..... 494c, 214, 485
City & South London, Cost of Motive Power..... 204c
Clearing from Snow..... 602, 608e
Colombia, So. Am..... 142
Colorado Midland, Busk Tunnel..... 171
Classes on English..... 133e, 601
Congo..... 494
Construction, U. S., 1892..... 608e
Cork, Blackrock & Passage..... 214
Cost of..... 553
Cuba, Western..... 429
Del. & Hudson Canal Co.'s Unloading Earth from Cars..... 316
Early New England and Canada..... 102
Electric. See Electric Railways.
Elevated. See Elevated Railways.
English, 27, 36, 44, 49, 60, 61, 82, 86, 109, 117, 133, 145, 155, 158, 159, 169, 173, 174, 189, 190, 193, 204, 206, 212, 214, 217, 224, 234, 241, 246, 257, 274, 357, 392, 400, 405, 409, 453, 462, 507, 477, 601, 553, 557, 573, 577, 597, 601
Cost of..... 274, 405, 553
Receipts..... 467
Three Class System..... 13e, 61
English Colonies..... 169c, 594
French, Employees..... 409
Govt. Inspection and Regulation of.... 221
Grand Trunk..... 425
Early Projects..... 102
Great Western, England, Change of Gage..... 173
Grenville & Carillon..... 425
Guatemala Northern..... 457
High Speeds on..... 541e, 461
Honduras..... 167
Honduras Inter-Oceanic..... 206c
Illinois, Statistics of..... 76
Illinois Central, New Orleans Trainshed. 306
Special Car for World's Fair..... 494
Standard Freight Car Truck..... 494
World's Col. Exp..... 339
Incline Cable..... 163
Mt. Nonotuck..... 73

e, Editorial; c, Correspondence.

England ... 117
Genoa ... 501
Montreal ... 425
Quebec ... 425
India ... 103, 109c, 141, 149, 165, 373, 503 504
Expensive ... 504
Financial Returns ... 141
Meter Gage ... 103
Intercontinental ... 66, 505
Intramural Elevated Electric, World's Col. Exp. ... 340, 362
Italy ... 44, 500
Notes on ... 39c
Jaffa to Ismailia ... 381
Jaffa to Jerusalem ... 237
Japan ... 190
Jura Simplon, Switz. ... 286
Kansas, Decline of Construction ... 396c
Labrador ... 298
Lancashire, Derbyshire & East Coast ... 26
Land Grant, Australia ... 549
Light, in Europe ... 217
Liverpool Overhead Electric ... 193, 400, 494
London ... 49, 238, 274, 409, 486, 492
London, Brighton & So. Coast ... 131c
London & Northwestern, "Charles Dickens" Locomotive ... 158c
Filters at Crewe ... 257
Los Angeles, Cal. ... 86c
Manchester to Newcastle ... 405
Midland, England ... 214
Classes of Passengers ... 133c, 601
Momoasa, Africa ... 141
Movable Sidewalk ... 145, 241, 340
Multiple Speed and Traction ... 145
Narrow Gage, Relative Cost of ... 254c
Natal ... 45
New Hampshire ... 251
New Orleans & N. W., Trestle-Filling by Dredge ... 401
New South Wales ... 56, 255c
N. Y., L. E. & W., Notes on ... 126
New York Rapid Transit ... 214
Designs of Structures ... 525
Specifications for ... 499
Nilgiri, India ... 97, 333
Norfolk & Western, Dunlow Coal Tipple ... 414
60-ft. Rails and Churchill Joints ... 532
Of the World ... 273
Mileage of ... 570
Otis Elevating ... 141, 162, 220
Pasadena & Mt. Wilson ... 40
Pennsylvania ... 217, 573
100-lb. Rail ... 56
Lighting of Tracks ... 573
New Broad Street Station ... 321
Washington Terminals ... 57
Philadelphia & Reading ... 10, 426
Fast Run ... 536, 541, 588
Growth of ... 426c
Pile, Ohio ... 331
Pittsburg Southern ... 326c
Pneumatic ... 25, 552
Profit Sharing on ... 214
Protection from Torrents and Landslides, Sicily ... 2c
Rack, ... 97, 121, 333
India ... 97, 333
Nilgiri, India ... 97, 333
Rothhorn, Switzerland ... 121
Raising Money for, Novel Plan ... 457
Rapid Transit, London ... 4c
Russian ... 1
Santos & Jundiahy, Brasil ... 567c
Slup, See Ship Railway
Sicily, Protection from Torrents, Etc. ... 260
Sliding ... 340
Snow on ... 602, 608c
South America ... 222
State Ownership ... 409
Swedish & Norwegian ... 49
Traffic, London ... 274
Trans-African ... 44
Transandine ... 145
Transcontinental, Poor's Project ... 1-3
Transcontinental, First ... 131
Trans-Siberian ... 119, 141, 137
Turkey ... 351
Turkey in Asia ... 556
Underground, (See Underground Railways).
Underground, Motors for ... 204c
Union Pacific ... 131
United States, Assets and Liabilities, 1891 ... 91
Change of Gage ... 173
Construction, 1892 ... 6, 8c
Earnings and Expenses, 1891 ... 91
General Statistics, Poor's Manual ... 85c
Mileage, 1891 ... 85c, 9
Mileage by Groups ... 571
Poor's Manual for 1892 ... 91
World's Col. Exp. Intramural ... 338, 481
See also Elevated, Electric, Ship, Street, Underground.
Railway Accidents (See Accidents).
Railway Congress, International ... 237
Railway Congresses, World's Fair ... 324c
Railway Construction: Asiatic Turkey ... 556
Cheap ... 376c
Correction ... 374c
Chinese ... 214
Far Western States ... 540c, 547
Light in England ... 372c
Northwestern States, Statistics ... 165, 108c
Southwestern States ... 341, 348c
Railway Crossings, Necessity for Night Watchmen at ... 540c
Railway Cut, Deep, Brooklyn ... 49
Railway Development in England ... 467
Railway Document, Herman Haupt ... 475
Railway Earnings ... 73, 91, 148, 381, 385, 457, 481
Railway Economics ... 217
Railway Employees: England, Overworking ... 36c
French ... 409
Insurance Fund for ... 322
Railway Engineering, Early, in New England ... 497
Railway Excursions ... 107
Railway Fares, Zone System, Ireland ... 214
Railway Gages ... 83, 102, 173, 425
Change, Gt. Western Ry ... 173
Railway Grade Crossings. (See Grade Crossings.)
Railway Improvements, 60 Years Ago ... 289
Railway Interchange Rules ... 133c
Railway Location, Problem in ... 350c
Railway Material, American in the British Colonies ... 102
Railway Mileage of the World ... 570
Railway Officers, duties of, C. & W. M. Ry ... 25
Railway Operation, Cost of, England ... 274
Railway Practice in India and the Colonies ... 109c, 594
Railway Rates, Regulation of English ... 274
Railway Record, Poor's, 1891 ... 85c
Railway Reports to Interstate C. Com. ... 241
Railway Schools ... 55, 45, 286
Swiss ... 286
Railway Shops ... 69
Electricity in ... 69
Railway Signaling, American and English. ... 392
Railway Statistics: Canada ... 195
Poor's Manual, 1891 ... 91
Railway Terminals: Chicago ... 60c
Rearrangement ... 54
Railway Tie Renewals ... 275
Railway Tracks, Proposed Elevation of, Chicago ... 60c
Railway Trains: Higher Speed for, 464 511, ... 588c, 592c
Load, U. S ... 85
Rainfall: Flow of Streams and Storage ... 366
Heavy, Boston, Mass ... 157c
New York City, 1891 ... 21
Providence, R. I ... 81, 494
Rates of Maximum, Correction ... 67, 182c
Experiments ... 202
Rainmaking Experiments ... 457
Appropriation for ... 12c
Rams, Hydraulic ... 271
Range-Finder ... 265
Rapid Transit: London ... 486, 492c
New York ... 241, 457
Design of Structures ... 525
Progress and Prospects ... 37c
Sale of Franchise ... 492c
Specification for ... 499
"Rapid Unloader," Lidgerwood ... 316
Ratchet Drill, Schuttler Continuous-Acting ... 318
Records: Bicycle ... 289
Ocean Steamship ... 93, 190, 385
Trotting ... 321c
"Nancy Hanks" ... 253c
Transatlantic, "Umbria" ... 132c
See also Fast Runs.
Reducing Valves, Acton's ... 171
Refrigerating Machines: For Cooling Buildings ... 12c
Measurements of Performance ... 18
Refuse Disposal ... 319, 325c, 522
Refuse Destructor. (See Garbage Cremator.)
Report of Chief of Engineers, U. S. Army. ... 506
Reservoirs: Amount of Oxygen at Different Depths ... 369
Asphaltum for Lining ... 563, 572
Birmingham, Ala ... 505
Regensburg, Germany, Repairing Wall. ... 429
Rockford, Covered ... 601
Storage Capacity of, Boston Water Works ... 366
Syracuse, N. Y ... 576
Rifle, Krag-Jorgensen ... 217, 329
Mannlicher ... 329
New Belgian, Marga ... 560
Ripley, Lieut. H. L., Correction ... 4c
River: Harlem, N. Y., Proposed Filling of ... 81c
Mississippi, Outlets ... 83, 121, 213, 214
St. Mary's, Lighthouse Plans ... 142c
Yukon, Alaska ... 442
River and Harbor Bill ... 25
River Diversion, Columbia, Wash ... 361
River Improvement: Black Warrior ... 357
Columbia R., Cascade Canal ... 262
Mississippi ... 83, 121, 213
Trinity, Texas ... 213
Rivet Diagram for Pin Connections ... 258
Rivet Values ... 518c, 542c
Roads: Good, and Railways ... 398c
Movement for Better ... 585
Proposed Department at Washington ... 468c
(See Highways)
Roadbed, Model, for Electric Ry ... 402
Road Locomotives, England ... 386
Road Roller: Pope Reversible ... 473
Steam, Light ... 504
U. S ... 434
Roanoke, Va., Survey ... 15c
Rock Drill: Marvin Electric ... 171
For Tapping Blast Furnace ... 457
Rolls: Chilled, Failures of ... 395
For Crushing Iron Ore ... 41
Chilled Iron, Failures in Necks of ... 441, 441c
Roller Bearing, Meneely ... 269
Rolling Stock, Shocks to by Rail Joints ... 195
Roofs: Arched, Large ... 195
"Weaving Shed" or "Ridge and Furrow" for Machine Shop ... 564c, 568
Strains in, Table of Coefficients ... 126
Roof Trusses: Homestead Steel Works ... 446
Specifications, Interpretation of ... 207c
Roundhouses, Form of ... 588c
Russia, Droughts in ... 328

S

Safe Load for Bearing Piles, 182, 398, 412, 460, ... 462c, 543, 544
Safety Clutches, Otis Elevating Cable Ry ... 220
Safety Stop, Rowell Potter; Boston, Revere Beach & Lynn R. R ... 369
St. Louis: Typhoid Fever ... 540c
Survey of ... 597
Sand Cement ... 213
Sanitary Commission, Boston ... 357
Sanitary Condition of Chicago ... 601
Sanitary Condition of Cities, Concealment of ... 81c
Sanitary Protection of Hemlock Lake, Rochester Water-Works ... 604
Sanitation and Cholera ... 300c
Satellite of Jupiter ... 251
Saw, Steel Disk for Cold Iron ... 370
Scale in Boilers ... 206
School, Railway ... 35, 45, 285
Schuylkill Valley, Pa., Industrial Development ... 372c, 376
Science, Great Problems of ... 227
Scraper: for Boiler Tubes ... 237
For Water Conduit ... 481
Screw Piles ... 522
Screw Pile Piers, India ... 116
Kotonow ... 324
Screw Propeller ... 467
Single and Twin ... 230, 337
Sea-Wall, Masonry, New York Harbor ... 549
Sea Water for Municipal Purposes ... 461
Search Light, Electric ... 337
Chicago ... 374
Mt. Washington ... 121, 337
Mt. Wilson ... 337
Sewage: Analysis of, So. Framingham, Mass ... 129
Chicago, Ill ... 301
Flow of, at Toronto ... 545
for Irrigating ... 193
Sewage Disposal: Chicago, Ill ... 381
London ... 226
Medfield, Mass ... 611
Meriden, Conn ... 202
Paris ... 566
Paterson, N. J ... 527
Plainfield, N. J ... 607
Providence, R. I ... 313, 548c
Woonsocket, R. I ... 251
Sewage Pumping Station, Orange, N. J ... 115
Sewage Purification in America: Amherst Mass ... 54
Boston Water-works, Drainage Area ... 195
Coney Island, N. Y ... 368
East Orange, N. J ... 520
Greenfield, Mass ... 196
Lawrence, Mass., Experiments ... 559
Lenox, Mass ... 53, 53
Long Branch, N. J ... 560
Marlborough, Mass ... 179, 180c
Medfield, Mass ... 611
Natick, Mass ... 98
Round Lake, N. Y ... 340
Sheepshead Bay, N. Y ... 368
South Framingham, Mass ... 126
Sudbury and Cochituate Watersheds ... 98
Summit, N. J ... 545
Wayne, Pa ... 422
White Plains, N. Y ... 284, 314
Worcester, Mass ... 77, 180c
Sewage Purification: and Storm and Ground Water ... 180c
London ... 226
Southampton, England ... 198
Sewerage: Budapest ... 469
Burlington, Vt., and Water Supply ... 84c
Calcutta ... 500
Capitol at Washington ... 429
Chicago ... 420c
Galveston, Tex ... 289
London, Barlow's Proposal ... 726
New Orleans ... 214
Orange, N. J ... 169
Philadelphia, Pa ... 361, 457
Providence, R. I ... 313
Reading, Pa ... 551
Rogers Park, Ill ... 607
San Francisco, Cal ... 269
Separate System, and Sewage Purification ... 180c
Shone System ... 130, 607
Woonsocket, R. I ... 251, 551
Sewers: Extensible Brace for Excavating, ... 5, 337
Fixtures, for ... 457
Flushing. (See Water for) ... 461
Gaging, Toronto, Ont ... 499
Los Angeles, Cal ... 457
Orange, N. J ... 385
Pipe: Cost of, Dallas, Tex ... 466
Dallas, Tex ... 518c
Diagram for Flow ... 126
Manufacture ... 473
Strength of ... 252c
Vitrified, Strengthened Joints ... 256
Toronto, Cost of ... 595
Siphons ... 457
Shaft, Stow Flexible ... 129
Shafting and Prime Movers ... 206c
Shaft Governor ... 537
Shafts, Chicago Four-mile Lake Tunnel ... 243
Shea ing Machine ... 370
Ships: Raising by Collapsible Cylinder ... 361
Sailing, "Roanoke" ... 201
Ship Building: American and English ... 325e, 609c
Lake ... 517
Ship Canal: Chesapeake & Delaware ... 177
Ireland ... 86c
Ireland, Sir E. Watkin's Scheme ... 60c
Ship Railway: Chignecto ... 214, 597
Georgian Bay and Lake Erie ... 110
Shipping, English and American ... 325e
Shipwrecks of the World ... 213
Shops and Factories: Floors for ... 564c
Lighting of ... 564c
Shops: New, Grant Locomotive Works, Chicago ... 125
Railway ... 69
Sidewalks, Radii at Street Corners ... 15c, 38c
Sidewalk, Movable ... 145, 241
Sieves, Cement Testing ... 386
Signal Bridges ... 180
Signal Plans, Nat. S. & S. Co ... 144, 392, 432
N. Y. Central R. R ... 97, 145, 536
Wuerpel ... 189, 529
Signal Posts, Color of ... 426
Signal and Switch Interlocking in England ... 145
Signaling: Block System, Standard Rules for Moving Trains ... 356, 373c, 379
Electric Light, Boughton's ... 553, 597
Hand, in England ... 392
Kinsman Block System ... 297
Signals ... 336, 392, 465
Arrangement of Blades and Lamps ... 393
Automatic ... 357, 392
Automatic Block, P. R. R ... 357
Automatic Stop and Visual ... 361e
Block, Rochester Electric Railway ... 361
Standard Rules for ... 355, 373
Uniform Practice ... 379
C. R. R. of N. J ... 393
Distant ... 392
And the Fitchburg Collision ... 373
English and American ... 353
N. Y. Central R. R ... 97, 145, 536
Railway Crossing ... 231, 394
Rowell-Potter Safety Stop ... 369
Southeastern Ry ... 44
Train ... 289, 298, 405
Compressed Air ... 298
England ... 405
Mason ... 298
Waterloo Station, London ... 392
Silver Smelting Plant ... 370
Siphons, Sewer ... 457
Siphon, Steam ... 11c
Ski, "Meaning of" ... 278c
Slag Phosphate ... 371
Phosphoric ... 395
Slates, Roofing ... 275, 323
Smelting Works, Silver, New Zealand ... 370
Smoke Prevention: Chicago Tugboats ... 64
Locomotives, M. C. R. R ... 43
Sargent Apparatus ... 436
Smokestack: Chimney ... 457
Warships ... 337
Snow on Railways ... 602, 608c
Snow Plows ... 602, 608c
Soap from Refuse Oil ... 94
Society Papers and Technical Journals ... 13c
Society Proceedings: Publication of, New England W.-Wks. Assoc ... 60c
Some Measuring of Velocity ... 241
Soundings, Deep Sea, Pacific ... 117
Sounding Machine, James' ... 2-6, 326c
Specifications: For Iron and Steel ... 11
For Roof Trusses ... 207c
For Structural Iron and Steel ... 111c
Speed, Bicycle and Horse ... 289
See Fast Runs and Records.
Spikes ... 102, 264, 514
Curved Hill ... 264
Greer ... 102
Spiral Riveted Pipe ... 461
Splices, Web ... 38c, 157c, 206c
Springs, Chrome Steel ... 395
Squares, Nitter's Table of ... 476c
-tage, Pneumatic Tires, Glasgow ... 187
Stand-pipes: Massachusetts ... 225
Nappanee, Ind ... 193
Standards, Electric Railway ... 394
Stations: Birmingham, L. & N. W. Ry ... 597
Broad St., Phila., Pennsylvania R. R ... 321, 338
Brooklyn Bridge ... 289
Fortified, India ... 196
Ill. Cent. Terminal, New Orleans, La., Trainshed for ... 536
Lahore, India: Northwestern Ry ... 196
Middletown, N. Y ... 604
New St., Birmingham, Traffic at ... 597
Cologne, Germany ... 332
P. R. R. at Philadelphia ... 73
Toronto ... 25, 49, 425
Terminal, N. Y. & N. J. Bridge ... 289
See also Terminals.
Statue of Liberty, Lighting ... 109, 251
Steam Car Heating vs. Hot Water ... 421c
Steam Distribution, Compound Engines ... 377
Steam Engine: In Modern Civilization ... 533
Invention of ... 253c
Jacketing ... 466
President Loring's Address to Am. Soc. M. E ... 549c
Steam Heating Co., New York ... 529
Steam Heating Pipes, Cleveland ... 213
Steam Jackets, Report on ... 465
Steam Jets, for Smoke Prevention ... 436
Steam Motors, Birmingham, England, Wear of Track ... 224
Steam Trap, Curtis ... 476
Steamers: "Alabama" ... 313
American Transatlantic ... 265
Arctic, "Fram" ... 601
Cable Laying ... 563
"City of Chicago's" Wreck ... 38c, 73
"City of Paris" Feed Water Heater ... 111c
Coaling at Sea ... 559
Cunard "Campania" ... 289
Cunard, New ... 97, 289
"Eider," Raising of ... 39
Fall River Line ... 357
Inman Line ... 73, 121, 356, 429
Inman and Red Star, to Run to Southampton ... 326
Lake ... 129, 289, 517
Cost of Ore Carriage ... 757
Ore Cargo ... 129
Light Draft, River ... 363
"Mackay-Bennett" ... 593
Mississippi River ... 363
Modern, Strength of Hulls ... 36c
Nansen's ... 601
New Atlantic ... 381
Passengers on ... 181
"Puritan" ... 337
Revenue ... 201
"Richard Peck" ... 337
Screw, Single vs. Twin ... 199, 530
Screw vs. Side Wheel ... 337
Side Wheel ... 145, 337
Transatlantic, 49, 73, 97, 190, 121, 265, 289, 326, 429, 539, 563
Express ... 49
Machinery of ... 539, 563
"Trave," Collision with Sailing Vessel ... 36c
Tugboats, Chicago, Smoke Prevention ... 64
Twin Screw, Sound ... 457
"Umbria," Transatlantic Record ... 132c
"Western Reserve," Wreck of ... 348c
Whaleback ... 251, 339
White Star Line ... 265
World's Col. Expos ... 339
Steamer Companies, Ocean ... 615
Steel and Iron: Exports, British, to the Colonies ... 141
Prices in Different Countries ... 44
Structural, Specifications for ... 111c
Steel: Basic and Bessemer, Southern Water ... 58
Carpenter ... 370
Chrome ... 370, 395
Cost, Pittsburg Mills ... 79
Crucible for Projectiles ... 370
Hardening ... 195
Open Hearth Forgings ... 97
Purification of, from Sulphur ... 498
Soft, Punching Tests ... 274
Surface-Blowing Bessemer Converter ... 242
Tipping Open-Hearth furnace ... 242
vs. Wrought Iron for Bridges ... 184
Steel Castings in India ... 149
Steel Forgings for Warships ... 97
Steel Foundry ... 480
Steel Manufacture, Southern States ... 58, 217
Steel Plant: Basic Bessemer, of Pottsdam Iron Co ... 370, 371
Youngstown, O ... 265
Steel Rail Manufacture, New South Wales ... 58
Steel Tools, Hardening ... 189
Steel Works: Gatling ... 597
Homestead, Pa., Details of Buildings ... 447
Stevens, Col. John ... 65
Stevens, Robert L ... 65
Stokers, Automatic ... 512
Stones, Building, Elasticity of ... 279, 300c
Stone, Utah ... 539
Stone Crusher, Electric ... 165
Storage Battery Cars ... 49, 259, 388, 403
Paris ... 451
Storage Battery System on Street Railways ... 211
Storrow, Chas. S., and Lawrence Scientific School ... 207c
Stoves, Hot Blast ... 371
"Strain" and "Stress" ... 5
Strains in Roof Trusses, Table of Coefficients ... 126
Streets: Damage by Heavy Wheel Loads. ... 409
Effect of Width of Wheel Tires on ... 218
Foliage on ... 539
Paving by Railway Companies ... 505
Street Cleaning: American Cities, Cost and Methods of Paying for ... 290
Chicago ... 94
New York ... 313, 469
Phila ... 441
Street Corners, Radii for ... 15c, 38c
Street Embankment, Breaking of, St. Paul, Minn ... 187
Street Grades ... 457
At Intersections ... 182c, 230c
Great Falls, Mont ... 537
Street Improvements, Assessments for ... 290
Street Intersections, Grades at ... 230c

e, Editorial; c, Correspondence.

Street Railways 299
Baltimore, Md., Curves on 451
Birmingham, England, Wear of Track 224
Car Replacer 138
Counterbalance on Steep Grades 193
England 224
Municipal Ownership 422
European Practice, as to Seating in Cars 543c
Fenders 121
Report of Mass. Comm 409
London 238, 381
Motive Power for 323
Municipal Ownership of 99
In England 381
Ninth Ave., N. Y 385
Storage Battery System on 211
Storage Battery Cars, Paris 451
Rail with Concave Base 138
Transfer System 2 9
Standard Rail Head 413
Transition Curves on 451
Employees 269
Motors, Compressed air, Judson 110
Judson, Threadless Screw 110
Motors, see Motors 299
Legislation 299
Street Roller. See Road Roller.
Street Sprinkling, Indianapolis 573
Street Watering, Sea Water for 461
"Stress" and "Strain" 5
Strike, Carnegie Mills, Homestead, Pa., 37e, 204
Switchmen's 164, 322
Submarine Boat, Baker's 457
Submarine Sentry, James' 226, 366c
Subways: Chicago 558
Providence, R. I 121
Philadelphia 457
Pipes and Wires, Nottingham, England 68
Sulphur: Elimination of from Iron 395
Purifying Iron and Steel from 498
Survey: Geological; Missouri 145
U. S 145, 370, 553
Survey: Roanoke, Va 15c
St. Louis Leveling 158c, 597
Topographical, California 429
Cost of 429
Surveying; Question of Monuments 182c, 230c
Treatise on 562
Surveyors: Cape Colony, Africa 99
Surveys, Topographical, Field-Table Plotting Sheet 80
Switch Stands 514
Switches and Signals 72

T

Table of Squares, Nitter 470c
Tanning by Electricity 66
Tap, Meaning of Word 86c
Tape Level 183
Tapes, Lufkin, Steel 561
Tar from Gas Works 419
Telegraph Co., Western Union 385
Telegraph Lines and Railways, China, 214, 458, 491
Telegraph System, Italy 500
Telegraphing: Between Lighthouse and Shore 529
From Trains to Stations 549
Telephones: Automatic Circuit Closer for, 172
New York and Chicago 333, 361
Stowger 476
Use of 73
Wires, Cincinnati 361
Telephoto 553, 557
Telescope: Chicago Univ 374, 553
45-in 361
Temperature, Apparatus for Recording 395
Temperature Regulator, Curtis 90
Tender, Locomotive, Wabash R. R 521
Tenement Houses of Boston 285
Teredos Action on Piles 201
Terminals, Brooklyn Bridge 73, 289
Chicago, elevated 54, 60c, 64, 91, 454
Torrence 454
N. Y. & N. J. Bridge 249
Penna. R. R. Washington 57
South Brooklyn 49
World's Col. Expos 189, 262, 340, 529
See Stations.
Tests: of Extension and Shortening, Johnson's Extensometer 114
of British Building Stones 279, 300e
Eye bars, Steel, Full size 40
Textile, "Ija" African 221
Thermostat 90
Thomason Collage, Roorkee, India 454
Throttle Valve 44
Ticket selling Machine, German 429
Ties: C. P. Ry 192
Cost of Renewals of 275
Electric Street Railway 402
Metal 48, 89, 214, 432, 504
Kinnear 524
Penn. R. R. Test 89
Steel 48, 504
China 214
Cost of in Germany 165
Hartford 432
N. Y. Central R. R 432
Wood, Preserved 515
Tie Plates: Goldie 475
India 44, 614
Rigid, English Rys 206c
Servis 288
Fastenings for 157c
Tilden Library Fund 228e
Timber Rafts 265
Timbering, Heavy, Proposed Methods 78
Time Allowance for Steam Yacht Racing 38c
Tin Deposits; Black Hills, Dak., Capt. Thomas' Report 208, 468e, 484
Tinning Machine 217
Tinplate: American 477
Analysis 35
Tipple, Coal, Dunlow, W. Va 414
Tires: Load per Wagon 241
Driving Wheel, Mech. Standard 597
Pneumatic, on Omnibus 587
Wear of Driving Wheel 347
Width of Wagon 178, 241, 539
Tools: Grant Loco. Works 125
Machine 125, 578
Steel, Hardening 189
Track 203
Tornado, Michigan, Curious 15c
Toronto, Ontario, Notes on 426
Torpedo Boats (See Warships)
Torpedo Storeship, "Pelican" 5
Towers: Eiffel, Otis Wheel Governor for 221
Electric Lighting, Arc 600
Water. (See Water Tower)
World's Col. Exp 145, 237, 241
Track, Railway 82
Central R. R. of New Jersey 370
Distortion by Earthquake, Japan 170
Electric Railway 307
Erie R. R 498
Indian State Rys 614
Fire damages on 263
L. & N. W. Ry 207
Metal 83
N. So. Wales Rys 56
Phil. & Reading R. R 371
Relaying on N. Y. Elevated Railway 385
Street Railway 224, 307, 403
Wear of 224
Track Labor with Light and Heavy Rails 262
Tracklaying Machines 395
Traction on Steep Grades, Van Zile System 218, 228e, 254c
Traction, Electric, Recent Improvements 307
Traction Car, Van Zile's, Electric 218, 228e, 254c
Traction Engines 289
England 286
Design of 506
U. S 434
Use of 396e
Traction Device, Van Zile's 218, 228e, 254c
Tractive Power for Train 289
Trade Unions, Incorporation of 35c
Traffic: Elevated Railways, New York 477
London 274
London and New York 486, 497
New St. Station, Birmingham 597
Railway, Hungary 237
London 274
St. Mary's Falls Canal 597
Steamship, Passenger 481
Train Loads, Freight, U. S 85
Train Signals: Electric 289
Electric, Ireland 557
England 405
Mason 238
Trains: Fast: Phil. & Read. R. R 25, 525
Brakes for 577, 588
Heavy Grain 237
Higher Speed of 464, 541, 588
Speed of English 573
Telegraphing from, to Stations 549
Trainsheds: Cologne, Germany 332
New Orleans, La., Ill. Cent. R.R 506
Penna. RR., Broad St., Phila 321, 338
St. Louis, Mo 262
Transformers, Electric 298
Transportation of Crowds 374e
Transportation, Lake, Cost of 337
Trap, Curtis Return 476
Traveler: Cologne Trainshed 332
Manufactures Bldg World's Col. Exp 74
Treasure, Diving for 256
Tree Cultivation in Canada 134
Trench Brace, German 337
Dam 5
Trestles, Otis Elevating Cable Ry 161
Trestle-Filling, Bucyrus Dredge 101
Trolley Cars, Van Zile's 218, 254c
Trolley Wires and Supports 428
Trotting Record, "Nancy Hanks" 253e 324e
Truck: Baines 274
Standard Freight Car, Ill. Cent. R.R 464
Trusses: Roof: Specification for 207c
Table of Strains 126
Stearns, for Highway Bridges 53, 111c, 255c
Tubes: Brass Condenser 477
Mannesman 111c
Tug Boats, Smoke Prevention, Chicago 64
Tunnels: Arlberg 250
Baltimore Belt 25, 49, 117, 121, 265
Damage to Buildings 121
Electric Traction 25
Baltimore & Potomac, Ventilating Plant 362
Breakwater, Chicago 577
Busk 1
Progress 171
Cascade 313
Cave-in 357
Chicago Water-Works, 10, 217, 236, 245, 282, 409, 573, 577
and Appendages 241
Corrosion in 475
Extra Work 282
Chicago River 10
Chicago Two-mile 577
Clement Mining 134c
Col. Mid. Ry 1
Coosa, Fire in 169
Detroit River 10
Dore & Chinley, England 477
Drainage, Mexican 476
Duluth, Minn 121, 361
East River 601
East and Hudson Rivers 1, 553
Great Northern Ry 313
Hoosac 250
Howard St., Baltimore 117
Hudson River 549
and English Engineers 245
Ireland to Scotland, Sir E. Watkin's Scheme 60e, 86c, 204e
Iron, Protecting Roof from Corrosion 475
Long 250
Measuring, Penn. R. R 477
Mersey, Liverpool Water Works 148
Difficulties in Driving 196
Mexico Main Drainage 93
Midland Railway, England 477
Mining, Idaho 1
Mt. Cenis 250
New York 1
N. Y., N. H. & H 73
N'agara 25, 93, 145, 193, 409, 501, 531
Niagara Falls, Canadian 145
Palisades, Proposed 476, 468e
Prince Edward Island 429, 481
Simplon 81, 250
St. Gothard 250
Tequixquiac, Mexico 93
Timeto Torrent, Sicily 260
York Farm, Pottsville, Pa., Fast Driving 38c
Tunnel Lining, Corrosion of Iron 475
"Tupic," Meaning of 278c
Turbine, Atkin's 592c
Typewriter in Cipher Writing 446
Typhoid Fever: Chicago 300e, 420e
Cincinnati 81
St. Louis 540e, 616c
Yorkshire 586

U

Underground Railways: City and South London, Cost of Motive Power 204e
Glasgow 44
London 49, 238, 274, 409, 486, 492
New York 457
Uniform Practice in Pile Driving 412
Discussion 438, 460
See also Pile.
University, Harvard, Lawrence Scientific School 277e

V

Valves: Gate, Finding by Magnet 134c
Intake Cover, Butte Dam 584
Loss of Head in Passing through 24-in 117
Steam Heating 384
Valve Post, Indicator 58, 97
Velocity of Projectiles, Measuring by Sound 241
Ventilating Plant, Baltimore & Potomac Tunnel 362
Ventilation, Capitol at Washington 429
Venturi Water Meter 16
Viaduct: Chicago 49
Gour Noir, France 149
Mt. Vernon, O 197
Voltmeters 258, 276e, 283

W

Wages, United Kingdom 217
Wagner Palace Car Co., Private Car Service. (See Cars)
Wagon, Austin Dump 212
War College 241
Warships: Battleships: U. S 313
"Indiana" 597
English 155
"Terror," U. S. N 481
Cruisers: U. S., "Brooklyn" 597
"Cincinnati," U. S. N 265, 457
"Columbia," U. S 73
Dynamite, "Vesuvius" 529
"Olympia," U. S. N 477
Russian, "Ruric" 501
Smokestacks for 337
U. S. Cruisers 73, 145, 265, 313, 457, 477, 529
Cutter, Revenue, Steam 201
Launching of 323
Forgings for 97
Torpedo Boat, French 148, 165
Torpedo Storeship "Pelican" 5
Water: Aeration of 180e
Amount of Oxygen Dissolved in 309
Analysis of Lake Cochituate 189
Chemical Analysis of 81
Connecticut River 563
Effect of Aeration on 183
Hot, Boise City, Idaho 337
Hot, Pumping 111c
Filtered, Cholera Infection by 529
Hauling, Purification of 501
Treating for Locomotives 121
Water Consumption: Philadelphia 389
Providence, R. I 81
Water Fixtures, Inspection of, Albany, N. Y 269
Water Mains: and Fire Service 42
Breaks in 217
Baltimore 49
Collar for Tapping 389
Corrosion by Electricity 587
Distributing, and Fire Service 61
Great Falls, Mont., Cost 126
Water Meters: Neptune 107
Register for 66
Venturi 16
Water Power: Austin, Tex 152
Baltimore, Md 141
Chaudiere Falls, Ottawa 425
Guadarrama River, Spain 506
Housatonic River 553, 587
Macon, Ga 73
Montmorency, Quebec 4 5
Niagara 93, 145, 477, 501, 531, 614
Cost of 145
Price of 477
Prospects for Development 489
Turbines for 501
Platte River, Neb 612
Salt, New York 505
Sewall Falls, N. H 145
Topeka, Kan 477, 505
Water Purifier, Anderson Revolving, Worcester, England 273
Water Rates, Denver 429
Water Supply: Aeration of 94
And Cholera 204e
Hamburg 573
Albany, N. Y 501
Austin, Tex 152
Baltimore, Md 573
Birmingham, Ala 503
Boston, Mass 505
Boston, Sewage Purification in Drainage Area 98
Brooklyn, N. Y 598, 603e
Burlington, Vt., Contamination of 84e
Chicago 361
Chicago Four-mile Tunnel 236
Four-mile Tunnel and Appendages, Extra Work 243, 282
Proposed Lock on Chicago River 182e
Cincinnati, O., Analysis of 81
Connecticut, Examination of 563
Decatur, Ill 298
Effect of Aeration on 181
Florence, Italy 135
Hamburg 501, 573
Hot 337
Jersey City, N. J 324e
Jersey City, N. J 385, 481
Large Cities 299
Liverpool, England, Vyrnwy Dam 146, 156e
London 605
Low 420
Madrid 506
Memphis, Tenn 262
Micro-Organisms in 603
Newark, N. J 110
Oakland and Stockton, Cal 214
Parry Sound, Ont 426
Philadelphia 94, 491, 539
Capacity of 286
Sewage Pollution 204e
Portland, Ore 598
Richmond, Va., Analysis of 81
Rochester, N. Y 553
Spokane Falls, Wash 237
Yorkshire and Typhoid Fever 586
Water Tank, Wooden, Failure of 251
Water Towers: Massachusetts 225
Norton, Liverpool Water Works 148
Waterways, France 525
Water Wheel: Pelton, Invention of 135, 594c
Water-Works Association 73
Water-Works: Boston, Amount of Oxygen in Reservoirs 309
Analysis of Cochituate Water 183
Rainfall, Flow and Storage of Reservoirs 366
Breslau 73
Brooklyn, N. Y 598
Test of Davidson Triple Expansion Engines 561
Butte City, Mont., Masonry Dam 554
Cincinnati, O 80
Analysis of Water 81
Constantinople, Ancient 5
Dubuque, Ia., Option to Buy 180e
Liverpool, Mersey Tunnel 196
Vyrnwy Dam 146
Madison, Wis., Fire Service 81
Minneapolis, Crude Oil Fuel 75
High and Low Pressure 601
Oliver Plow Works, South Bend 357
Peoria, Ill 26
Details of Pumping Station 58
Philadelphia, Consumption of Water 389
Notes from 1891 Report 404
Providence, R. I., Consumption of Water 81
Rainfall 81
Reports Notes from Recent 315, 321
Richmond, Va., Analysis of Water 81
Rochester, N. Y 505
Hemlock Lake 604
Evaporation Experiments 604
Regulation of Pressure 521
Schuyler, Neb., Driven Wells 199
South Bend, Ind 357
Syracuse, N. Y 384
Tacoma, Wash 433
Worcester, England, Anderson Revolving Purifier 273
Yonkers, N. Y., Consumption 515
Value of Purchase Option 189e
Watkin, Sir Edward, and Irish Ship Canal, 60e, 86c
Watt, James, and the Steam Engine 244e
Wattmeters 283
Weather, New York City, 1891 21
Weather Reports: June, 1892 69
July 179
August 310
September 405
October 501
Weather, Severe, Rocky Mtns 361
Web Plate Splices 38c, 131c, 157c, 206c
Welding: Electric 69
Carriage Factories 553
Wells: Artesian: Galveston, Tex 123
California 121
Irrigation from 342
On the Plains 10
Texas 10, 122, 265
Utah 539
Driven, Schuyler, Neb 199
Memphis, Tenn 262
Well-Sinking Plant: Galveston, Tex 122
On Wheels 572
Wharf, Iron, Fort Monroe, Va 38c
Wheel Governor, Otis Elevating Cable Ry 221
Wheel Tires, Width, in Cities 248
Pneumatic 587
Wind Strains in Mill Buildings 470c
Wire, Copper 289
Wires for Trolley Lines 428
Wire Gages 537, 588e
Wire Glass 90
Wood, as a Paving Material 229
Wood Preservative, Finch, Toronto 426
Wood-stone, Xylolith 90
World's Columbian Exposition: Accidents 262
Aquarium, Pumps for 477
Architecture 10, 536
Attendance to July, 1892 1
Berlin Exhibits 525
Cameras at 324e
Cars, Special, Ill. Cent. R. R 192
Chief Engineer 273
Congresses at 59, 224e, 398c, 420e, 428, 514
Mining Engineering 514
Decoration 606
Dept of Liberal Arts Classification 218
Department of Manufactures 219
Electric and Steam Launches 153
Electric Light Plant 58
Electric Wire Conduit 58
Engineering Congress 59
Engineering Education at 178
Engineering Exhibits 219
Engineering Headquarters 59, 286
Exhibits, Berlin 525
Engineering 217, 219
Fine Arts 606
Locomotive, English, Old 193
Mining, Canada 58
Naval 606
Penn. R. R 217
Railway 606
Transportation 75, 606
Fine Arts 606
Fire Protection 606
Fisheries 477
Fountain, McMonnies 606
Hygiene and Sanitation 510
Interlocking at Terminal 529
Intramural Railways 358, 581
Intramural Elevated Electric Railway 362
Krupp Gun 10, 265
Leakage of Roofs of Buildings 511
Locomotive Exhibits, Old English 193
Locomotives for 264
Machinery Building, Foundations 9
Mail Distribution 433
Manufactures and Liberal Arts Building 74, 194, 218, 6 6
Erection of 74
Mining Exhibits, Canada 58
Movable Sidewalk 241
Naval Exhibits 606
President of 178
Progress 154
Railway Exhibits 6 6
Railway Terminal 529
Sanitation and Hygiene 516e
Sewerage 607
Special Passenger Cars, Ill. Cent. Railroad 402
Statuary 606
Steamers 369
Stone Pillar, 420 Tons 529
Switch and Signal Plant 529
Terminal Interlocking and Signals 180
Terminal Station 262
Tower 145, 237, 241
Traction Engines 435
Transportation 434
Transportation Building 605
Transportation Exhibits 75, 606
Wrecks: "City of Chicago" 73
"Western Reserve" 364
Whaleback Steamer 251
Wrench, Ide, for Pipes 83
Wrought Iron vs. Steel for Bridge 184

X

Xylolith Building Material 90

Y

Yachts, Steam, Time Allowance for Racing 38c

Z

Zone Fare System, Hungary 237
Ireland 214

PERSONAL.

Adams, J. M., 130; Adams, M. B., 513; Allen, C.A., 298,442, 466; Allis, S. M., 322; Anderson, J. R., 251; Anderson, Jos. R., 251.

Baerman, P. H., 392; Baird, J. Q., 10; Baker, W. T., 178; Barbour, V. G., 35; Barrath, E., 369; Barrett, J. H., 298; Bates, T. M., 587; Bauer, W., 322; Bean, A. C., 391; Birdsell, J. C., 106; Blackie, B., 536; Blunt, C. E., 59; Bogart, John, 35; Bogges, E. M., 298; Bowen, C. B., 417; Bowers, R. L., 59; Brawner, H. E., 339; Brown, F. W., 607; Bruce, D., 273; Buchholz, C. W., 322, 442; Burgwin, H. K., 513; Burr, W. H., 179.

Calhoun, W. H., 202; Campbell, T. M., 59; Campbell, Wm., 417; Canfield, T. M., 490; Carpenter, L. G., 251; Case, M. E., 607; Chadbourne, B. F., 82, 345; Chandler, C. C., 391; Chapin, G. S., 10; Clarke, B. G., 154; Clay, M. G., 10; Cogswell, W. B., 607; Colby, H. H., 10; Cole, A., 466; Cook, C. M., 35; Cook, E. E., 346; Cook, T., 107; Cook, W. L., 513; Corthell, E. L., 59; Coste, L., 106; Cowden, M. D., 202; Craig, W., 202; Crane, W. E., 202; Craven, A., 418; Crehore, W. W., 154; Creighton, J. M., 490; Crider, T. E., 10; Crocker, W. J., 107; Croes, J. J. R., 298, 466, 536; Cunningham, A. C., 10; Cunningham, G. C., 154; Curphey, D., 513.

Dabney, J. W., 107; Danell, D. J., 58; Danes, W. S., 82; Davis, W. A., 130; David, G. F., 536; Davidson, G., 130; Davis, Milo, 273; DeCoursey, S. G., 273; Derby, W. M., 587; Dewitt, E., 59; Dixon, G. W., 154; Dockweiler, J. H., 587; Dore, J. E., 369; Douglas, H. T., 369; Dorrance, O. H., 322; Drexilius, 562; DuBarry, J. N., 607; Duerr, H. O., 59; Dunham, F. A., 106; Dunlap, D. C., 273; Durrell, D. J., 107.

Eayrs, N. W., 10; Eddy, E. M. G., 251; Eddy, L. D., 226; Edwards, H. W., 82, 154; Eldridge, C. J., 466; Evans, G. E., 298.

Farleigh, J. A., 226; Feind, B., 35, 59, 82, 181n, 202; Felt, C. F. W., 59; Fields, S. J., 562; Fisher, F. D. 490; Fisher, H. A., 226; Fitch, C. R., 466; Floesch, J. M., 82; Folger, W. M., 490; Forbes, 202; Fox, J. W., 178; Francis, J. B., 266; Fratt, F. W., 35; Frazier, J. L., 154; Fritch, e, L. C., 607; Frizell, J. P., 82; Fteley, A., 417; Fuertes, E. A., 298; Fulham, G. W. C., 391.

Gayley, J., 442; Geraldine, Dion, 298; Geeting, W. R., 178; Gibson, C., 369; Gillingham, Wm. J., 226; Gilpin, H. E., 466; Gladding, H. H., 130; Goodwin, H. S., 607; Gould, E. S., 226, 536; Gould, J., 536; Gould, W. T., 607; Gowen, C. S., 418; Grace J., 442; Grafton, W. M., 251; Gray, S.

Gray, W. E., 587; Greene, D. M., 587; Groves, E. W., 35; Guidet, C., 322.

Hagen, L., 587; Hall, A. D., 369; Hallock, A. B., 466; Hamilton, W. S., 322; Hannaford, E. P., 322; Hardy, J., 417; Harris, W. D., 298; Haskin, J. W., 442; Hassard, T., 130; Hatch, W. B., 442; Haupt, L. M., 298; Havens, R. W., 490; Hawks, J. D., 346; Hector, M., 322; Hedley, E. M., 490; Hering, R., 226; Herschel, C., 298; Hicks, J. O., 536; Hill, J. W., 298; Hills, L., 35, 58; Hinton, R. J., 346; Hobson, J., 322; Hodges, H. B., 417; Holbrook, E. M., 392; Holly, H. H., 226; Holmes, H., 251; Hood, R. H., 226; Howell, J. C., 251; Hoyt, F. W., 82; Hubbard, C., 607; Huerne, P. L. E., 369; Hull, B. H., 587; Hunt, A. E., 587; Huston, S. W., 130.

Johann, J., 490, 513; Johnson, J. W., 466; Johnson & Flad, 35; Judson, C. A., 58.

Kandeler, Th., 59; Keating, E., 58, 346; Kendall, E. O., 298; Kendrick, J. W., 587; Kennedy, J., 273; Kerr, D., 442; Kiersted, W., 442; Kimball, G. A., 35; Kimball, G. L., 226; Kimber, J., 273; King, Z., 418; Kingsley, M. W., 59; Kirkland, A., 226; Kline, T. D., 442; Knapp, L. H., 562.

Latrobe, B. H., 36e; Lawler, C. M., 298; Lea, R. S., 513; Lee, S. S., 202; Lehmann, K., 417; Leighton, S. M., 490; Leofred, A., 490; Letang, E., 536; Lewis, F. H., 587; Lewis, D. J., 107; Loehr, L. W., 82; Loss, C. E., 466; Lowe, T. S. C., 35; Ludlam, S., 442; Ludlow, Col., 91, 132, 513.

Mackenzie, 442; Maguire E., 369; Maguire, M. W., 463; Mann, E. F., 178; Mann, G. E., 562; Manning, W. T., 202, 369; Marburg, E., 298, 322; Marsh, A., 417; Marsh, W. W., 226; Matthews, J. F., 562; Matthews, W. J., 298; McBride, J. T., 346; McClure, F. A., 442; McDonald, H., 536; McElroy, J. F., 536; McKee, W. J., 417; McLennan, P. B., 607; McLaughlin, G. T., 154; McMath, R., R., 82; Medway, J., 202, 513; Mendell, G. H., 130; Mellen, C. S. 442; Merriam, A. C., 442; Merrick, H. C., 35; Moore, J. C., 466; Mordecai, A., 442, 562; Morris, J. W., 562; Morris, R. C., 514, 536; Morse, W. E., 417; Muir, W. K., 59; Mulliken, J. B., 514.

Nelson, A. A., 322; Nelson, J. R., 466; Nettleton, E. S., 251; Newberry, J. S., 562; Nickerson, T., 82; Norton, A. G., 35; Norton, B., 106, 490; Norton, Frederick O., 322; Nutt, H. C., 179.

O'Donnell, J. P., 322; Olhausen, J. H., 513; Onderdonk, A., 106; Ortton, J., 513; Osborn, F. C., 178.

Parker, C. J., 202; Parsons, W. B., 587; Pearson, E. J., 10; Peary, R. E., 298, 490, 556; Pike, W. A., 35; Pitzman, J., 466; Porter, H. F. J., 154; Porter, J. B., 562; Potter, A., 346; Potter, C. F., 322, 369; Pottinger, D., 513; Poynor, D. A., 466, 490; Prendergast, F. E., 273; Price, J. A., 130; Putney, H. M., 273.

Quackenbush, A. W., 490, 513, 562.

Randolph, L. S., 417, 442; Rauchfuss, O. K., 10; Raymer, A. K., 154; Raymond, E., 178; Raymond, W. G., 10; Reed, H. W., 513; Relf, R., 178; Reynolds, E., 273, 535, 490; Rice, G. L., 298; Riddle, H., 154; Ripley, H. L., 369, 420; Ritchie, J., 417; Robinson, D. B., 513; Rosing, A., 107; Ross, M. D., 322; Rounds, W. P., 202; Rushforth, W. H., 178.

Sample, J. H., 178; Sargent, F. W., 536; Schreiber, 417, 436; Schroll, 442, 154, Schrop, I. S., 392; Schwab, C. M., 442; Schwanecke, H. A., 58; Schwatka, F., 442; Scott, L. J., 562; Sedgwick, T. S., 513; Sewall, D. D., 536; Sewall, J. H., 536; Shankland, E. C., 273; Shanks, J. W., 417; Shaw, M. C., 298; Shea, J. T., 154; Shnable, E. R., 369; Shoemaker, A. T., 562; Siemens, E. W., 536; Slocum, J. C., 10, 339; Smeed, E. C., 202, 226, 251; Smith, A. 587; Smith, I. A. 322; Smith, P., 533; Snyder, J. H., 10; Sorzano de Tejada, J. F., 298; Spates, A., 514; Spaulding, C. F., 442; Stanwood, G. 202; Stebbins, W. L., 442; Stevens, J., 65; Stevens, R. L., 65; Stilwell, M. 417; Storey, W. R., 202; Storrow, C. S., 207; Stowell, C. F., 10; Struthers, T., 322; Stuart, A. A., 490; Sturtevant, G. W., 130; Sweigard, I. A., 130.

Taylor, L., 298; Thomson, J. P., 587; Thompson, L. E., 130; Torrey, A., 346; Tout, H., 513; Tracy, T. W., 391; Trowbridge, Wm. P., 154; Tschirgi, M., 536; Turner, G. H., 35.

Uniacke, R. F., 59; Unwin, W. C., 202.

Voorhees, T., 562; Vreeland, H. H., 587.

Walbridge, A. C., 178; Warrington, J. N., 556; Waterman, G. C., 490; Webb, W. L., 298; Wegmann, E., 418; West, W. S., 322; Westinghouse, G., 251; White, J. F., 562; White & Clark, 35; Williams, B., 226; Wilson, A., 130; Wilson, D., 154; Wooton, E. H., 35; Worth, Col., 106; Wright, G. F. 226, 339.

Yeats, R. H., 369.

Zinn, A. S., 10.

NEW PUBLICATIONS.

Arithmetic of Electricity, 10; Association of Provincial Land Surveyors of Ontario, 443.

Batiments De la Marine Francaise, 274.

Commercial Information Concerning the American Republics and Colonies, 107; Comparative Architecture, 443; Compass, 131.

Das Eisenbahn Geleise (Railway Track), 82; Der Verkehr Londons (Traffic of London), 275; Descriptive Index of Current Engineering Literature, 107; Die Elektrischen Accumulatoren und Ihre Verwendung in der Praxis, 536; Dredging on the Pacific Coast, 107; Dynamometers and the Measurements of Power, 131.

Electric Accumulators, 536; Electric Light in Buildings, 251; Electric Lighting Specifications, 202; Electric Railways, 346; Elements of Machine Design, 131; Engineers' Surveying Instruments, 532.

Facts about Sewerage and Other Public Works, 563; Final Reports of the Irrigation Inquiry, 179; First Report of the Bureau of Mines, 443.

General Specifications for Combination Iron and Steel Railway Bridges, 466; Geological Survey of Texas, 10.

Highway Construction, 418; Hints to Gas Consumers, 563.

Illinois Society of Engineers and Surveyors, 251; Indiana Engineering Society, 227; Introduction to Geodetic Surveying, 443; Introduction to the Study of Determinants, 347; Inventive Progress, 418; Iowa Society of Civil Engineers and Surveyors, 82; Irrigation Manual, 107.

Kentucky Geological Survey, 35.

Law of Incorporated Companies Operating Under Municipal Franchises, 227; Leitfaden der Mechanik (Guide to Mechanics), 587.

Mechanics, Guide to, 587; Michigan Engineers' Annual, 35; Mineral Resources of the United States, 227; Modern Locomotive Construction, 442.

Newport Water-Works, 107; North Carolina Board of Health, 490.

Official Railway List, 10; Original Papers on Dynamo Machinery and Allied Subjects, 563.

Pasadena & Mount Wilson Railway, 179. Paving Problem, 346; Poor's Directory of Railway Officials, 323; Poor's Manual of Railroads, 131; Proceedings of the Twenty-fifth Annual Convention of the American Railway Master Mechanics' Association, 202; Provincial Board of Health of Ontario, 490.

Questions and Answers About Electricity, 274.

Railroad Engineer's Practice, 131; Railway Car Construction, 131; Railroad Spiral, 562, 607; Railway Track, 82, Ready Reference for Engineers and Steam Users, 490; Report of the Chief of the Division of Forestry for 1891, 35; Report of the Governor of Arizona, 490; Report of the R. R. Commissioners of the State of New Hampshire, 251; Report of the Tenth Annual Meeting of the Amer. Street Railway Association, 35; Rules Governing Interlocking Devices, 418.

Sewerage of Two New Hampshire Towns, 59; Should the Rainfall Experiments be Continued, 202; Simple Lessons in Drawing for the Shop, 418; Southern and Southwestern Railway Club, 107; Standard Electrical Dictionary, 419; State Board of Health of Connecticut, 563; State Board of Health of Maine, 466; State Geologist of New Jersey, 107; Statistics of Railways in the United States, 466; Street Railways, 131.

Table Book for Civil and Mechanical Engineers, 347; Tables and Memoranda for Engineers, 539; Text Book of Experimental Engineering, 202; Text book on the Method of Least Squares, 346; Theory of Errors and Method of Least Squares, 443; Traffic of London, 275; Transformers, 298; Transition Curve Field Book, 562, 607; Trautwine's Civil Engineer's Pocket Book, 490.

Useful Information, 274; U. S. Board on Geographic Names, 274; United States Journal of Artillery, 274.

Water-works Reports, 35; Woodworker's Manual, 418.

SOCIETY PROCEEDINGS.

American Gas Light Association, 419; American Institute of Electrical Engineers, 419; American Institute of Mining Engineers, 10, 274, 370, 514; American International Association of Superintendents of Bridges and Buildings, 323, 419; American Railway Association, 370; American Society of Civil Engineers, 275, 323, 370, 392, 419, 443, 467, 491, 563, 607; American Society of Irrigation Engineers, 563; American Society of Mechanical Engineers, 370, 490, 537; American Society of Railroad Superintendents, 299; American Street Railway Association, 107, 323, 393; Association of Engineers of Virginia, 83, 443; Association of Superintendents of Bridges and Buildings, 323, 419.

Boston Society of Civil Engineers, 251, 419; Brooklyn Institute, 467.

Canadian Society of Civil Engineers, 443, 563; Central Railway Club, 274, 323, 514; Civil Engineers' Club of Cleveland, 59, 274, 490; Columbian Engineering Society, 538; Connecticut Association of Civil Engineers and Surveyors, 202; Cornell Association of Civil Engineering, 538.

Denver Society of Civil Engineers and Architects, 514.

Engineering Association of the South, 83, 155, 392; Engineering Society of Western Pennsylvania, 443; Engineers' Association of Virginia, 35; Engineers' Club of Cincinnati, 10, 179; Engineers' Club of Philadelphia, 370, 419, 491, 539, 587; Engineers' Club of St. Louis, 299, 538, 563; Engineers' Society of Western Pennsylvania, 35, 347, 392, 538; Executive Committee of Engineering Socities, Columbian Exposition, 59

Indiana Engineering Society, 607; Institution of Mechanical Engineers, 155, 467.

Liverpool Engineering Society, 467, 539, 563.

Master Car & Locomotive Painters' Association, 155; Master Carbuilders' Association, 275; Michigan Engineering Society, 490.

New England R. R. Club, 370; New England Roadmasters Association, 179, 202; New England Water Works Association, 274, 538; N. Y. Railroad Club, 227, 274, 587; Northwest Railroad Club, 299; Northwestern Electric Light Association, 202.

Ohio Institute of Mining Engineers, 59; Oregon Academy of Sciences, 467.

Roadmasters' Association of America, 274, 299, 323, 514.

Southern & Southwestern Railroad Club, 131, 443, 539, 607; Street Railway Association of New York, 299.

Utah Polytechnic Society, 539.

Victorian Institute of Surveyors, 323.

Western Railway Club, 299, 514; Western Society of Engineers, 227.

PRICES.

Ammonia, 395; Asphalt floor, reservoir, 576.

Bailing, 384, 576; Ballast, 336; Beams, I, 576; Blocks, granite paving, 600; Bolts, 576; Breakwater, 47, 240, 360; Brick, 47; (curbing, 432; facing for wells, 576; paving, 72, 529, 616; pressed 576; sewer, 72, 360, 552, 576; tunnel, 552); Bridging, see stone; Brush, 366, 560, 528; Bulkheads, sewer, 432, 504.

Cable, chain, 576; Canal, Chicago drainage, 408, 432; Caps, timber, 528; Cars, electric, 393; Castings, iron, 23; (special, 47, 144 192, 216, 240, 264, 384, 408, 576, 616); Catch basins, 47, 72, 192, 240, 288, 408, 432, 456, 480, 504, 600; Cement, 23, 47, 120, 240, 264, 309, 360, 504; Chain, iron cable, 576; hopping, 384, 576; Clearing, 384, 576; Coal, 72, 259; Cobble, 480; Concrete, 23, 72, 240, 360, 312, 360, 408, 480, 552, 600; Conduits, water, Syracuse, 384, 576; Coping, stone, 384, 576; Cornice, galvanized, 576; Cribwork, 23, 240; Crossings, iron gutter, 288; Crosswalks, 47, 96, 120; Culverts, 384, 480, 504, 600; Curbing, 96, 144, 168, 192, 216, 240, 288, 360, 369, 432, 480, 504, 600.

Dam, 23, 240, 536; (Croton, New York, 23, 240); Doors, 576; Drain, tile, 384; Drainage, 288, 384, 576; Dredging, 47, 144, 264, 312, 336, 360, 384, 576, 577, 600, 616; (ditch, 616; lake channels, 577, 600); Drilling wells, 5.8.

Edge stone (see Stone); Electric fittings for cars, 393; Embankment, 23, 240, 263; Excavation (canal, 178; ditch, 616; earth, 23, 47, 72, 144, 240, 288, 312, 326, 384, 408, 432, 480, 504, 576, 600; foundation, 336; glacial drift, 432; hardpan, 384; loam, 47, 600; rock, 24, 47, 96, 144, 240, 288, 312, 326, 384, 408, 432, 456, 576, 600; soil, 23, 240, 576, 600; street, 72, 288; trench, 216).

Fence, 23, 240; Filling, 23, 216, 240, 312, 504, 600; Flagging, 47, 168, 192, 600; Flush tanks, 23, 47, 72, 96, 144, 216, 288, 312, 432.

Galvanized iron, 576; Garbage cremation, 49, 522; Gas, natural, 361; Grading, 72, 144, 192, 264, 288, 312, 504, 600; Grass, sowing, 576; Gravel, 72, 309, 384; Grubbing, 384, 576; Gutters, galvanized, 576; Gutter stone, 600.

Hand rail, 576; Hydrants, 240, 264, 504, 528.

Iron and steel, 44, 79, 360; (foreign, 44); Iron (cast, 384, 576, 600; elevated railway, 432; galvanized, 576; roof of Manufactures Building, 194; structural, 194, 576; wrought, 384, 576, 600); Iron milling, 82; Ironwork, penstocks, 288; Irrigation, 329.

Jetty, 336.

Labor, 337; Lampholes, 23, 96, 216, 240, 288, 312, 432; Land, 29; Lead, 144; Levees, 264, 288, 384; Lighting (electric, 47, 72, 96, 120, 144, 168, 192, 216, 240, 264, 288, 312, 336, 360, 384, 433, 456, 480, 505, 528, 552, 600, 616; gas, 144, 288, 432, 600); Liming, tunnel, 552; Loam stripping, 600; Lock, Black Warrior river, 337; Locomotive performance, 190; Lumber, See Timber.

Manholes, 23, 47, 72, 96, 144, 216, 240, 288, 312, 408, 432, 456, 480, 504, 600; Masonry (brick, 23, 24, 72, 96, 240, 384, 432, 480, 504, 600; concrete, 24, 72, 96, 384, 432, 480, 504, 576; culvert, 384, 600; cut stone, 600; dressing, 23, 240, 576; force, 576; lock, 337; rubble, 23, 96, 240, 384, 408, 480, 576, 600; stone, 24, 24, 72, 240, 288, 337, 384, 432, 480, 600; tunnel, 552); Mattress, 336, 528; Meters, 264, 504; Nails, 384, 576.

Painting, 288, 384, 576; Paving (asphalt, 4, 47, 93, 120, 144, 166, 216, 240, 384, 456, 528, 529, 576; belgian block, 192; block, 47, 95, 168, 192, 288, 360, 480, 528, 600; brick, 4, 47, 72, 96, 120, 144, 168, 192, 240, 264, 265, 288, 312, 360, 384, 432, 456, 480; cobble, 4, 480, 576; comparative cost, 4; conduit, 384; crosswalk (See Crosswalk); flag, 120; foundaton, 309; granite block, 47, 96, 168, 288, 480, 600; macadam, 4, 72, 192, 480, 600; maintenance of, 5; Paris, 369; relaying, 369; rubble, 192; sandstone block, 360; scoria blocks, 47; Sidewalk, brick, 47, 96, 120, 168, 192; flag, 168; stone, 4, 47, 6, 120, 192, 360, 384, 456, 480, 528, 600; telford, 72; wood, 4, 144, 288, 432, 504, 616; Piles and piling, 24, 96, 264, 4, 6, 480, 504, 528, 576; Pile caps, 528; Pipe (cast iron, 47, 144, 168, 192, 216, 240, 264, 360, 384, 408, 432, 504, 528, 576, 616; cement, 600; clay, 96; Converse, 408; culvert, 504; drain, 72, 456; iron, 23, 384, 408; iron sewer, 144, 432; Matheson, 408; riveted, 408; sewer, 72, 144, 408, 600; steel, 408; wrought iron, 408); Pipe laying, 528, 576. Pipe testing, 384; Pitch, 395; Plank, 384, 576; Puddling, 576; Pumping engine, 504.

Rails, 44, 79; (relaying, 528); Railway (construction, 326, 576, 595; construction, Australia, 110; elevated, 432; rack, 595); Refilling, 23, 240, 312, 504; Refuse collection, 329; Repaving, 481; Reservoir, Syracuse, N. Y., 576; Rip rap, 23, 240, 264, 360, 384, 432; Rock, 528; (removing, 360); Rods, 44; Rolling, 576; Roofing, (cement and gravel, 576; tin, 384); Rubble, dry, 23, 240.

Sand, 95, 144, 309, 360, 369; Sewers (clay pipe, 93; Boston, Mass., 24, 72, 432, 480, 504; brick, 47, 72, 95, 144, 240, 360, 384, 456, 480, 504, 595, 600; iron pipe, 96, 144, 456; lateral, 360; Orange, N. J., 23; pipe, 23, 96, 144, 240, 288, 312, 360, 384, 408, 432, 453, 456, 595, 600; tile, 23, 288; Toronto, 360; tunnel, 552); Sewer branches and connections, 23, 96, 288, 408, 432, 480; Sewerage, Shone system, 191; Shafts, tunnel, 552; Sheathing, tunnel, 23; Shells, 264; Shore protection work, 336; Sidewalk, see Paving, sidewalk; Slag, 504; Sodding, 23, 240; Spikes, 384, 576; Steel, 79, 432; (elevated railway 432); Steel manufacture, 79; Stone, 360, 528, 576; (basalt, 528; breakwater, 47, 240, 360; bridging, 288, 360; broken, 23, 96, 240, 309, 336, 406; coping, 384, 576; cut, 384, 576, 600; dimension, 384, 576; dressing, 576; edge, 120, 144, 168; filling, 576; gutter, 600; jetty, 336; rip rap, 23, 240, 264, 360, 384, 432; screenings, 96); Street cleaning, 313, 616; Street sprinkling, 572; Stringers, 528.

Ties, 336, 528; Tile, 23, 47, 216, 288, 432, 534; Timber, 23, 24, 360, 384, 408, 432, 456, 480, 504, 576, 600; (foundations, 23, 408; sheathing, 23); Towers, elec ric light, 600; Track, relaying, 528; Trenching, 552, 576; Trestles, 326, 528; Tunnel, sewer, 552; Tunnel lining, 552; Turbines, 288.

Valves, 240, 251, 504; Valve setting, 576; Valve boxes, 264.

Wages, 434; Walls (retaining, 384, slope, 384, 576); Water, irrigation, 329; Water power, 145; Wells, 528, 576, 600; Wells, brick facing, 576; Windows, 576.